APPENDIX A

PETRO-CHEMICAL SYSTEMS, INC. / TURTLE BAYOU SUPERFUND SITE 2007 RD/RA CONSENT DECREE

Lyondell Chemical Co., et al. V. Albemarle Corp., et al.
No. 01: 01-CV-890 (E.D. Tex.)

RECORD OF DECISION AMENDMENT

PETRO-CHEMICAL SYSTEMS, INC.
(TURTLE BAYOU)
SUPERFUND SITE

REGION 6
SEPTEMBER 2006

DECLARATION
PETRO-CHEMICAL SYSTEMS, INC.
RECORD OF DECISION AMENDMENT

Statutory Preference for Treatment as a
Principal Element is Met
and Five-Year Review is Required

SITE NAME AND LOCATION

Petro-Chemical Systems, Inc. (Turtle Bayou)
Liberty County, Texas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Record of Decision (ROD) Amendment for the Petro-Chemical Systems, Inc. (a.k.a. Turtle Bayou) site (the site) in Liberty County, Texas. The amended remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), Section 117(c), and the National Oil and Hazardous Substances Contingency Plan (NCP), Section 300.435(c)(2)(i). The ROD Amendment is based on the administrative record file for the site.

The public was provided an opportunity to provide comments on the Proposed Plan during the public comment period. The public comment period began on April 12, 2006, and ended on May 12, 2006. A public meeting was held at the Calvary Baptist Church located at the corner of Farm-to-Market (FM) Road 536 and County Road (CR) 129 (a.k.a. Liberty Heights) to provide the local community an opportunity to provide verbal and/or written comments on the Proposed Plan. The United States Environmental Protection Agency (EPA) has reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, the EPA has determined that the following changes to the ROD modifications identified in the Proposed Plan are required.

The original ROD for this site was signed in 1991. In a 1998 ROD Amendment, the EPA redefined the previous site boundary of approximately 500 acres to include only the contaminated portions of property and all suitable property in very close proximity to the contamination necessary for implementation of the remedial design and remedial action. The contaminated areas identified in the 1998 ROD Amendment were the West Road Area, the Main Waste Area, the Office Trailer Area, the Easement Area, the Bayou Disposal Area, and CR 126 (formerly known as Frontier Park Road). This redefinition of the site boundary was based upon information available at the time. Since the 1998 ROD Amendment, two additional areas have been identified – the CR 126 West Area and MW-109 Area. Based on how waste was disposed at the site, it is unknown if additional waste disposal areas will be identified in the future. This being the case, the site boundary is reverting to the original definition in the 1991 Record of Decision – approximately 500 acres. The discovery of new contaminated areas at the site and the results of the extensive remediation already performed at the site form the basis for this ROD Amendment.

The State of Texas concurs with the ROD Amendment.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the ROD Amendment, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE ROD AMENDMENT

This ROD Amendment addresses the following modifications to the previous 1991 ROD and the 1998 ROD Amendment:

1. Documenting that a Technical Impracticability (TI) determination for restoration of portions of the shallow ground water at the site (the S1 sand and the deeper S2 sand) has been made for the site.

2. Expanding the scope of the remediation to include an additional contaminant source area designated as the County Road (CR) 126 West Area (a.k.a. Far West Road Area).

3. Identifying the remedy for the CR 126 West Area.

4. Identifying factors which support granting a TI waiver for the Main Waste Area, the West Road Area, the Office Trailer Area, the Easement Area, and the CR 126 West Area.

5. Presenting MW-109 Area information, although no remedial decisions for this area are being made at this time because further investigations should be conducted.

6. Amending the site's ground water cleanup levels.

7. Amending the site's soil cleanup criteria.

8. Amending the remedy for the Bayou Disposal Area.

9. Amending the remedy for the Main Waste Area's on-site soils vault.

10. Designating that the exact boundaries of the TI Zones will be established after a two-year transitional monitoring period. The two-year monitoring period will also be used to determine whether the selected remedy is effective to prevent contaminants with concentrations exceeding the groundwater protection standards from migrating beyond the S1 and S2 TI zone boundaries

11. Identifying contingency remedies for the site in the event that future groundwater monitoring demonstrates that the plumes of contaminated ground water are expanding in either the S1 or S2 sand. These contingency remedies could be implemented, if necessary, at any of the impacted areas throughout the site.

These modifications are summarized below.

Remedial operations have been occurring at the site over the past seven years. The remediation systems initially began as field pilot studies to support remedial design activities and expanded into full-scale remediation systems. The primary technologies used at the site were ground water extraction with nutrient and oxygen amended injection (in-situ bioremediation) and soil vapor extraction (SVE). Other technologies applied in more recalcitrant areas included in-situ thermal desorption (i.e., soil heating), in-situ chemical oxidation using potassium permanganate injection and bio-augmentation. In general, the areal extent of the ground water contamination has been greatly reduced and a significant amount of contamination has been removed. However, it has been demonstrated across the site that the ability of the remedial technologies to continue removing the remaining contamination has declined significantly over time and has plateaued in recent years. While the remedial technologies have reduced the mass of contaminants, considerable mass remains at moderate concentrations. The contaminants, left primarily in the site's clay and silt soils, continue to act as a source of contamination to the underlying ground water. It was estimated that it would take up to 160 years and cost $80,625,000 to reach the ground water cleanup criteria with continued operation of site's remedial system in the West Road Area, Main Waste Area, Office Trailer Area, and Power Easement Area. Other potential remedial technologies were evaluated and determined to not be viable due primarily to the volume of contaminated soils and the inability to remove the remaining contamination from the site's clay and silt soils in an efficient and cost effective manner. The EPA has determined that in areas where significant disposal has taken place, complete restoration of ground water is technically impracticable and that the applicable or relevant and appropriate requirements (ARARs) for ground water restoration will be waived.

The CR 126 West Area was identified after issuance of the April 1998 ROD Amendment. In 1999 and 2000, additional wells were installed in this area by Lyondell Chemical Company to delineate the extent of contaminated ground water. As of 2004, a total of 20 shallow wells (approximately 20 feet deep), two intermediate wells (approximately 50 feet deep), and two deep wells (approximately 90 feet deep) had been installed. One shallow slant well was also installed under CR 126 in 2001. Additionally, over 150 soil samples were collected from 21 soil borings to investigate the extent of contaminated soil. Additional investigations, performed by Tetra Tech EM Inc. on behalf of the EPA, entailed sampling private water wells, select monitoring wells, soil gas and surface soil sampling locations. The results were used to estimate the extent of contamination and evaluate remedial alternatives. Additional investigations were performed by Environmental Resources Management (ERM) on behalf of EPEC Polymers Inc. to support ground water modeling efforts and to further define the extent of contamination for remedy alternative evaluations in 2005. As part of this field effort, approximately 1000 soil and groundwater samples have been collected and analyzed for constituents of concern. The CR 126 West Area information was used in combination with the field experience gained over the years from Lyondell Chemical Company's remedial activities to screen and evaluate potential remedial alternatives.

This ROD Amendment identifies the selected remedy for the CR 126 West Area which includes the following components:

- Using augers to mechanically mix the soils in the central disposal area of the CR 126 Area to a depth of 25 feet with chemical oxidant to treat the most affected soils and a portion of the shallow ground water zone (referred to as the S1 zone) and using lime, cement, or fly ash to strengthen the soils.
- Using a vapor capture system that will route vapors from the auger mixing to a treatment or adsorption system (such as a thermal oxidizer or activated carbon).
- Installing temporary security fencing around the active remediation area.
- Temporary rerouting, or replacing the county road around the treatment area.
- Placing temporary berms around the active remediation area.
- Hydro-mulch seeding of the disturbed area to provide erosion control.
- A new roadway after active remediation has been completed.
- Implementing institutional controls through either obtaining property ownership or restrictive covenants for the property necessary to implement the remedy and protect human health and the environment. Restrictions will be placed that will prohibit the installation of drinking water wells that may contribute to plume migration or result in exposure. The restrictions will also prohibit excavations in the CR 126 West Area without prior approval.

This ROD Amendment further discusses various factors found in the CR 126 West Area and across the site that inhibit ground water restoration and support the granting of TI waivers. Investigations conducted at the CR 126 West Area and the other areas of the site indicate that the conditions related to the three factors below work to preclude the timely cleanup of contaminated ground water:

- Hydrogeologic factors;
- Contaminant related factors; and
- Remediation system inadequacies.

Based on the large volume of waste, it is not cost-effective to attempt to excavate and remove all affected soil. It has also been demonstrated that ground water remediation is not cost-effective since once remediation is terminated, the contaminant concentrations in ground water will rebound as long as a substantial portion of residual contamination remains.

Monitoring well MW-109 is a shallow (i.e., 30 foot) ground water monitoring well located approximately 1000 feet east of the CR 126 West Area and approximately 300 feet west of the West Road Area along CR 126. From August 2000, through May 2005, MW-109 was sampled 21 times. Ground water samples from MW-109 did find elevated contaminant concentrations of benzene varying from non-detect to 13,000 parts per billion. In September 2000, Lyondell Chemical Company replaced an existing residential well in the MW-109 Area with a new well. The new well has a completed depth of 186 feet below ground surface and was constructed to prevent the well from acting as a migration pathway for ground water from the shallow water-bearing zone into deeper water bearing zones. Data in the MW-109 Area indicates that the extent of ground water contamination is limited (based on the results of ground water sampling conducted in surrounding permanent and temporary wells). Additional studies are being planned to further evaluate the extent of contamination in this area. An evaluation of all the MW-109 information will be used to determine if remedial action is required to address the contamination. If remedial action is required, it will be documented in a subsequent EPA decision document.

This ROD Amendment amends the site's ground water contaminant cleanup levels to include levels for vinyl chloride (2 micrograms per liter - µg/L), 1,2-dichloroethane (5 µg/L), cis-1,2-dichloroethylene (70 µg/L), trans-1,2-dichloroethylene (100 µg/L), 1,2-dichloropropane (5 µg/L), 1,1,2-trichloroethane (5 µg/L), trichloroethylene (5 µg/L), 1,1-dichloroethylene (7 µg/L), styrene (100 µg/L), and toluene (1000 µg/L). These contaminants were detected at elevated concentrations in the CR 126 West Area. These contaminants are not exclusive to the CR 126 West Area, but were in fact found in multiple locations throughout the site. The ground water cleanup levels for these contaminants are their Federal Drinking Water Standards [i.e., Maximum Contaminant Levels (MCLs)]. An MCL is the highest level of a contaminant that EPA allows in drinking water.

Additional contaminants detected at elevated concentrations in the CR 126 West Area are acetone, 1,1-dichloroethane, and tert-buytl alcohol. These contaminants do not have established Federal cleanup criteria for either soil or ground water. The Texas Commission on Environmental Quality (TCEQ) has recommended the following ground water cleanup values for these contaminants: acetone (22,000 µg/L), 1,1-dichloroethane (2,400 µg/L), and tert-butyl alcohol (2,200 µg/L). These TCEQ ground water cleanup values are Texas Risk Reduction Program, Tier One Ground Water Protective Concentration Limits and are recommended when complete site-specific information is not available.

Since the 1998 ROD Amendment, a significant change in the site's current and anticipated land use has occurred for large portions of the site. Specifically, for the site's West Road Area, Main Waste Area, Office Trailer Area, and Easement Area, residential land use is no longer reasonably anticipated. Lyondell Chemical Company has acquired these properties and will restrict access to these areas such that residential use on this property will not occur. In regards to the CR 126 West Area and the Bayou Disposal Area, EPEC Polymers Inc. has initiated contacts with landowners regarding sale or deed restrictions that allow EPEC Polymers Inc. to purchase the properties or ground water rights and/or provide land use restrictions. Potential future exposures would likely be limited to road utility workers, trespassers, site maintenance workers and contractors involved in the ground water monitoring program.

In consideration of the change in land use for large areas of the site, the following non-residential direct contact (i.e., for 0 – 5 feet below ground surface) soil cleanup criteria have been developed for benzene (36 parts per million – ppm), vinyl chloride (10 ppm), naphthalene (190 ppm), and lead (800 mg/kg). In developing the non-residential direct contact cleanup criteria, the EPA and TCEQ considered both the TCEQ's Tier 1 Commercial/Industrial Soil Protective Concentration Limits (PCLs) and a contaminant specific site worker exposure evaluation. In land use on the site is not restricted as anticipated, the residential cleanup criteria in the 1991 ROD and the 1998 ROD Amendment will apply.

The remedy for the site's Bayou Disposal Area will be amended to replace 1998 ROD Amendment requirement for the construction of the graded clay layer with selected vegetation planted and developed so as to minimize infiltration or rain water (i.e., living cap) with the following components:

- Limited excavation of up to 300 cubic yards of contaminated soil and offsite disposal at a permitted facility. Soil excavation will be conducted as necessary to achieve the soil remedial criteria.
- Run-off and run-on control and hydro-mulching as may be warranted to address potential erosion.
- Plugging or conversion of water wells presently located on the Bayou Disposal Area and potentially those wells located on nearby properties into monitoring wells.
- Institutional controls to limit potential exposure to affected ground water and soil.

The remedy for the Main Waste Area on-site soils vault is revised to remove the 1991 ROD requirement that it be dismantled. Requirements for leaving the vault intact include:

- Obtaining permanent control of the property, either by fee-simple purchase of the property or by securing a written agreement with the property owner.

- Implementing of a ground water monitoring program to assist in the long-term monitoring.
- Fencing the area to prevent unauthorized access.
- Placement of an irrevocable deed restriction on the property to prevent activities that might adversely affect the integrity of the vault and monitoring wells.
- Provide for perpetual maintenance and access to the vault.

Prior to defining the TI zones at the site, a two-year transitional monitoring period will occur. Separate ground water monitoring systems will be maintained for the S1 and S2 sands at each contaminated area at the site and used during the two-year transitional monitoring period to collect contaminant, hydrogeologic, and geochemical parameters for each of the monitored zones. In general, the two-year transitional period will be used to establish ground water contaminant plume baselines in the S1 and S2 sands and to evaluate the degree to which natural biodegradation processes will reduce contaminant mass within the S1 and S2 sands for the various contaminated areas. The primary monitoring objective will be to demonstrate that the plumes are stable or declining in nature and that there is no risk to receptors. The monitoring will be performed in conjunction with the establishment of institutional controls to prevent human exposure to contamination exceeding the site's soil and ground water cleanup goals. It is anticipated that the TI zones will encompass the current extent of the ground water plumes in the S1 and S2 sands. The monitoring described in this paragraph will be performed in conjunction with the establishment of institutional controls to provide greater assurance that human exposure to contamination above the site's soil and ground water cleanup levels will be prevented.

Modeling has shown that the migration of contaminants will not take place beyond the current plume boundaries. Based on the current data, the plumes appear stable. But if ground water monitoring results indicate that the extent of the ground water contamination with contaminant concentrations exceeding the protection standards will expand or is expanding beyond a TI zone boundary in any of the impacted areas across the site, whether in the S1 or the S2 sands, additional studies will be conducted as necessary to develop and evaluate alternative contingent remedial measures that may be used to prevent such plume expansion, and appropriate remedial measures will be implemented. Such contingent measures may include one or more of the following:

- Plugging of wells and installation of replacement wells.
- Monitored natural attenuation.
- Ground water pumping, potentially with in situ bioremediation (e.g., via nutrient injection).
- In situ ground water sparging or air stripping.
- The injection of nutrients to enhance natural attenuation.
- Supplemental source assessment, if necessary, followed by additional excavation, in situ chemical oxidation, or other treatment technology to reduce contaminant mass.

- Installation of a slurry wall, reactive barrier, horizontal grouting, or other containment structure.

The nature of any contingent response to be implemented will be determined based on the rate and contaminant mass that will migrate or has migrated beyond a TI zone boundary.

STATUTORY DETERMINATIONS

The amended remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and will be cost effective. This remedy will utilize permanent solutions and alternative treatment technology, to the maximum extent practicable, and will satisfy the statutory preference for remedies to employ treatment that reduces toxicity, mobility, or volume as a principle element.

Because this remedy will leave hazardous substances remaining on-site, a review will be conducted pursuant to the current five-year review schedule for the site to ensure that the remedy continues to provide adequate protection of public health and welfare and the environment. The next five-year review for the site is scheduled for 2010.

Samuel Coleman, P.E. Director Superfund Division	9/22/06 Date

US EPA CONCURRENCE PAGE

Record of Decision Amendment
September 2006
Petro-Chemical Systems, Inc. Site
EPA ID# TXD980873350

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Remedial Project Manager

09/21/2006
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Staff Attorney

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Gustavo Chavarria
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09/21/06
Date

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<u>APPENDIX</u>

ACRONYMS AND ABBREVIATIONS

~	Approximate
AHI	Applied Hydrology International
ARARs	Applicable or Relevant and Appropriate Requirements
BDA	Bayou Disposal Area
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CPT	Cone Penetrometer Test
CR 126	County Road 126
D	Duplicate sample
DCA	Dichloroethane
DCE	Dichloroethene
DNAPL	Dense Non-Aqueous Phase Liquid
FID	Flame Ionization Detector
FM 563	Farm to Market Road 536
ISTD	In-Situ Thermal Desorption
J	Estimated value
L	Reported concentration is below the contact-required quantitation limit
LDR	Land Disposal Restriction
LNAPL	Light Non-Aqueous Phase Liquids
MCLs	Maximum Contaminant Levels
mg/kg	Milligrams per kilogram or parts per million
MIP	Membrane Interface Probe
MNA	Monitored Natural Attenuation
MSSL	Medium-Specific Screening Level
MW	Monitoring Well
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
µg/L	Micrograms per liter or parts per billion
NA	Not Available
NAPL	Non-aqueous phase liquid
NCP	National Oil and Hazardous Substances Contingency Plan
ND	Not detected above analytical detection limit
NS	Not Sampled
OU1	Operable Unit 1
OU2	Operable Unit 2
PAH	Polycyclic Aromatic Hydrocarbon
PCL	Protective Concentration Limit
ppb	Parts per billion
ppm	Parts per million
ppmv	Parts per million by volume
PNA	Polynuclear Aromatic
PWS	Private Water Supply Well
R	Rejected laboratory sample
RCRA	Resource Conservation and Recovery Act

ACRONYMS AND ABBREVIATIONS (Continued)

RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROG	Remedial Operations Group, Inc.
SC	Screening Criteria
SPLP	Synthetic Precipitation Leaching Procedure
SRI/FFS	Supplemental Remedial Investigation/Focused Feasibility Study
SSI-AER	Supplemental Site Investigation and Alternative Evaluation Report
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
TACB	Texas Air Control Board
TAL	Target Analyte List
TBA	Tert-Butyl Alcohol
TCEQ	Texas Commission on Environmental Quality
TI	Technical Impracticability
TMW	Temporary Monitoring Well
TNRCC	Texas Natural Resource Conservation Commission
TRRP	Texas Risk Reduction Program
TW	Temporary Well
UAO	Unilateral Administrative Order
US EPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Record of Decision (ROD) Amendment addresses several modifications to the 1991 ROD and the 1998 ROD Amendment. These modifications are based on the knowledge gained over the past several years during the field implementation of active remediation systems identified in the previous decision documents, as well the information obtained during subsequent field investigations, technical impracticability demonstrations completed by Lyondell Chemical Company and EPEC Polymers, Inc., bench scaled testing, and a field pilot study and ground water modeling efforts conducted since the 1998 ROD Amendment.

1.1 Site Name and Location

Petro-Chemical Systems, Inc., (a.k.a. Turtle Bayou) Superfund Site
Liberty County, Texas

1.2 Lead and Support Agencies

U.S. Environmental Protection Agency – Lead Agency
Texas Commission on Environmental Quality

1.3 Statute Requiring Record of Decision Amendment

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Section 117(c), and National Oil and Hazardous Substances Contingency Plan (NCP), Section 300.435(c)(2)(i).

1.4 Circumstances that led to the need for a Record of Decision Amendment

This ROD Amendment is required to document that the U.S. Environmental Protection Agency (US EPA) and the Texas Commission on Environmental Quality (TCEQ) have determined that complete restoration of the contaminated ground water (i.e., attainment of MCLs) at the site is technically impracticable. This ROD Amendment also:

- Expands the scope of the remediation at the site to include an additional contaminant source area designated as the County Road (CR) 126 West Area (a.k.a., Far West Road Area);
- Identifies a remedy for the CR 126 West Area;
- Identifies factors which support granting a technical impracticability (TI) waiver;
- Presents MW-109 Area information;
- Amends the site's ground water cleanup criteria;

- Amends the site's soil cleanup criteria;
- Amends the Bayou Disposal Area remedy;
- Amends the Main Waste Area soils vault remedy;
- Designates that the TI zones will be established at the site after the completion of active remediation activities and a two-year transitional ground water monitoring period; and
- Identifies contingency actions which may be implemented should contaminated ground water migrate beyond the TI zones as designated.

1.5 Administrative Record

The ROD Amendment will become part of the Administrative Record for the Petro-Chemical Systems, Inc. site. The administrative record is available to the public for review during regular business hours at the following locations:

Liberty Municipal Library
1710 Sam Houston Ave.
Liberty, Texas 77575
(936) 336-8901
Monday-Thursday 10:00 am – 6:00 pm;
Friday 1:00 pm – 5:00 pm; Saturday 10:00 am – 4:00 pm

US EPA, Region 6
7th Floor Reception Area
1445 Ross Avenue
Dallas, Texas 75202-2733
Toll free phone number 1-800-533-3508
Monday – Friday 8:00 am – 4:00 pm

Texas Commission on Environmental Quality
Records Management Center
Building D, Room 190
12100 Park 35 Circle
Austin, Texas 78753
Toll free phone number 1-800-633-9363 or 512-239-2920
Monday – Friday 8:00 am – 5:00 pm

2.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

The Petro-Chemical Systems Inc. Superfund site is located in rural Liberty County, fifteen miles southeast of Liberty, Texas. The site is approximately six miles north of Interstate 10 along Farm to Market Road 563 (FM 563), which borders the site to the west. CR 126 was previously known as Frontier Park Road and provides access to the site from FM 563. The site has also been referred to as the Turtle Bayou site. The site's east boundary is the Turtle Bayou tributary to Lake Anahuac (see Figure 1).

Unpermitted waste disposal appears to have started in the late 1960s. Disposal of waste at the site is documented in the Texas Water Quality Board records as early as 1971. Records indicate the dumping of waste oils in unlined pits and on Frontier Park Road. Since the site was never an authorized waste disposal facility, the exact nature of disposal activities at the site is uncertain. However, it appears that the waste was dumped indiscriminately from trucks at numerous locations, and that waste disposal activities continued after 1971.

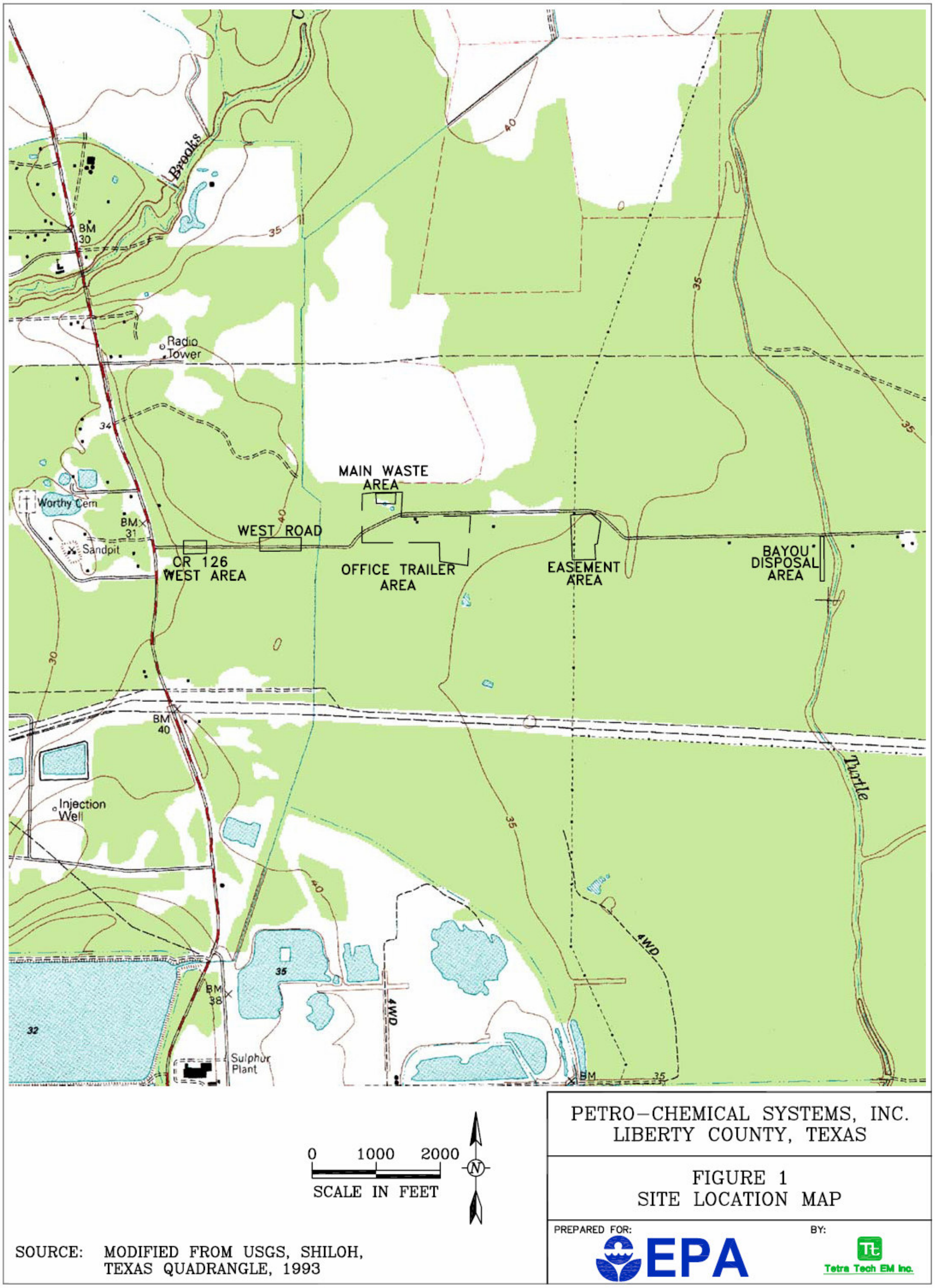
In 1971, an application for commercial industrial waste disposal permit with the name of Petro-Chemical Systems, Inc., was filed with the State of Texas. The application included a site development plan. In response to the application, local citizens organized to oppose the application. After public hearings were held and additional information was evaluated in response to a citizen's suit, the State's approval for the application was withheld. In 1974, Petro-Chemical Systems, Inc., withdrew the application.

The site has since been subdivided into five-acre and fifteen-acre plots and sold for residential development. Residential use of the site has been continuous since 1974, except during the previous remedial activity on Frontier Park Road completed in August 1988, during which the US EPA temporarily relocated site residences. No residents live on any of the identified disposal areas; however, six families live adjacent to waste disposal areas (the CR 126 West Area, Easement Area, and the Bayou Disposal Area).

With the enactment of the Comprehensive Environmental Response, Compensation, and the Liability Act (CERCLA) in 1980, interest in the site was renewed. In 1984, the US EPA proposed the site for inclusion on the National Priorities List (NPL). The site was placed on the NPL in 1986. As an interim precautionary measure, warning signs were posted at the site's Main Waste Area and 2,400 feet of fence were installed.

The site was previously divided into two operable units (OU). Contamination along CR 126, formally Frontier Park Road (OU 1), was addressed first. The remedial investigation (RI) and feasibility study (FS) conducted in 1986 found that several sections of CR 126 were contaminated with volatile organic compounds (VOCs) and polynuclear aromatics (PNAs). Potential risk to local residents, particularly those living on the site, was high.

The ROD for OU1, signed on March 27, 1987, called for the excavation of 5,900 cubic yards of soil contaminated with the PNAs or total VOC concentrations greater than 100 milligrams per kilogram (mg/kg). Contaminated soils ranging from one to five feet in depth were excavated along the first 1,800 feet from the intersection of CR 126 and FM 563. The excavated materials were placed in an aboveground vault constructed in the Main Waste Area. The excavated area was backfilled with clean soil, and the entire length of the road was paved. This work was completed in August 1988.


Brooks
BM 30
Radio Tower
34
Worthy Cem
BM 31
Sandpit
CR 126 WEST AREA
WEST ROAD
MAIN WASTE AREA
OFFICE TRAILER AREA
EASEMENT AREA
BAYOU DISPOSAL AREA
BM 40
Injection Well
Turtle
4WD
BM 38
Sulphur Plant
0 1000 2000
SCALE IN FEET
N
SOURCE: MODIFIED FROM USGS, SHILOH, TEXAS QUADRANGLE, 1993
PETRO-CHEMICAL SYSTEMS, INC.
LIBERTY COUNTY, TEXAS
FIGURE 1
SITE LOCATION MAP
PREPARED FOR:
EPA
BY:
Tetra Tech EM Inc.

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A second RI/FS was conducted in 1988 to define the nature and extent of contamination throughout the rest of the site (OU2). A supplemental RI and focused FS (SRI/FFS) were also performed in 1991. In addition to CR 126, the RI/FS and SRI/ FFS identified the following five waste disposal areas: the West Road Area, the Main Waste Area, the Office Trailer Area, the Easement Area, and the Bayou Disposal Area. Soil and underlying shallow ground water were contaminated primarily with VOCs and polycyclic aromatic hydrocarbons (PAHs). Additionally, small isolated areas of soil were found to contain lead concentrations up to 5,000 mg/kg.

The shallow aquifer is not currently being used as a source of drinking water on-site. However, the shallow aquifer does have the potential to be used as a source for drinking water in the future and is considered a class 2-B aquifer. A class 2-B aquifer has water quality such that it is a usable aquifer but that for other reasons (i.e., low water yield capacity) is not currently used. The contamination of the shallow aquifer was determined to present future potential risk above health-based levels. Therefore, exposure to contaminated groundwater was considered the primary site risk for OU2.

The site's 1991 ROD addressed OU2 and identified source control remedial alternatives for application at the site. For the Main Waste Area (including the above ground landfill), the Office Trailer Area, the West Road Area, and the Easement Area, the specified remedy for the contaminated soil included the following:

- Soil vapor extraction to remove volatile organics from affected soils;
- Air injection below affected soils to enhance removal of volatile organics;
- Vapor collection by soil vapor extraction wells and transport for treatment through surface piping;
- Catalytic thermal destruction of volatile organic vapors;
- Storm water vertical infiltration control by an engineered soil and synthetic liner cap;
- Dismantling of the aboveground landfill with (if warranted) remedial action for the potentially contaminated soils beneath the landfill;
- Consolidation of lead contaminated soils in the Main Waste Area followed by capping.

For the Bayou Disposal Area, the 1991 ROD specified the placement of an engineered soil and synthetic liner cap to control vertical infiltration of storm water.

The 1991 ROD also identified remedial alternatives to address groundwater contamination in the West Road Area, Main Waste Area, Office Trailer Area, and the Easement Area. The 1991 ROD specified:

- Removal of volatile organic contaminants using vapor extraction (in-situ air stripping);
- Vapor collection and transport followed by catalytic thermal destruction of volatile organics;
- Horizontal migration control with a slurry wall.

Additional 1991 remedy components included the installation of structures to control storm water runoff, ground water monitoring, and the restoration of the site surface upon completion of remedial action.

On December 22, 1993, the US EPA issued a Unilateral Administrative Order (UAO) for the OU2 remedial design and remedial action. Pursuant to the UAO, Lyondell Chemical Company (previously known as ARCO Chemical Company) and Atlantic Richfield Company worked with the US EPA and the Texas Natural Resources Conservation Commission (TRNCC -- currently the TCEQ) to complete the site's remedial design. The OU2 remedial design, which included several field pilot studies, began on September 21, 1992, and was completed on May 22, 1998.

On April 30, 1998, the US EPA issued a ROD Amendment. The ROD Amendment modified the soil cleanup criteria for benzene identified in the 1991 ROD. The 1991 ROD soil cleanup criteria were based on numerical model predictions of the allowable benzene concentrations in soils that, when attained, would not result in exceeding the federal drinking water standards in the underlying shallow aquifer via leaching. The benzene soil cleanup criteria modification was based on the following:

- Reevaluation a numerical model using site-specific data collected after the 1991 ROD; and
- Consideration of the TCEQ's residential exposure standard for benzene in soil from zero to two feet below ground surface.

All other 1991 ROD performance standards, including the benzene ground water cleanup criteria, were not changed.

The 1998 ROD Amendment modified the various remedial components to be used independently or in combination to achieve the site's performance standards. The selected remedy to address contaminated soils in the West Road Area, Main Waste Area, Office Trailer Area, and the Easement Area included the sequenced application of soil vapor extraction, bioventing, and monitored natural attenuation. The designated remedy for the contaminated soils in the above ground vault located in the Main Waste Area included the combination of soil vapor extraction and aqueous phase bioremediation. Additional contingent remedy components for the contaminated soils of the above ground vault included bioventing and soil washing. For areas designated as "hotspots," additional remedy components were identified. Hotspots were defined as areas with high concentrations of dissolved and/or free phase non-aqueous liquids with benzene concentrations in excess of 100,000 parts per billion (ppb) at depths greater than ten feet. The additional remedy components included thermal desorption, focused hotspot excavation and on-site biotreatment, excavation and offsite disposal/treatment, and containment and infiltration control.

The 1998 ROD Amendment revised the contaminated ground water remedy in the West Road Area, Main Waste, Office Trailer Area, and the Easement Area from in- situ air stripping to in-situ bioremediation. The site's in-situ bioremediation system used injection wells in combination with extraction wells to circulate oxygenated water with nutrients to stimulate bacteria and other microbial forms of life to help cleanup the contamination. The extracted water was pumped to the site's water treatment plant, treated to standards developed by the TCEQ, and discharged. The 1998 ROD Amendment also included monitored natural attenuation and institutional controls.

For the Bayou Disposal Area, the 1998 ROD Amendment modified the 1991 ROD remedy of an engineered soil and synthetic liner cap to a “living” cap consisting of a graded clay cap and selected vegetation. The cap’s goal was to minimize the infiltration of storm water, thereby reducing the potential migration of soil contaminants to the underlying shallow groundwater. Previous soil data from samples collected in the Bayou Disposal Area indicated that the soils had already met the soil cleanup criteria.

On December 8, 1998, the US EPA entered into a Consent Decree with Lyondell Chemical Company and Atlantic Richfield Company. The Consent Decree supersedes the provisions of the UAO that address obligations of Lyondell Chemical Company and Atlantic Richfield Company. Pursuant to the Consent Decree, the Lyondell Chemical Company and Atlantic Richfield Company are required to address contamination in the site's West Road Area, Main Waste Area, Office Trailer Area, and the Easement Area. The US EPA and TCEQ were required to address contamination in the Bayou Disposal Area.

Since the 1998 ROD Amendment, a significant change in the site’s current and anticipated land use has occurred for large portions of the site. Specifically, for the site’s West Road Area, Main Waste Area, Office Trailer Area, and Easement Area, residential land use is no longer reasonably anticipated. Lyondell Chemical Company has acquired these properties and will restrict access to these areas such that residential use on this property will not occur. In regards to the CR 126 West Area and the Bayou Disposal Area, EPEC Polymers Inc. has initiated contacts with landowners regarding sale or deed restrictions that allow EPEC Polymers Inc. to purchase the properties or ground water rights and/or provide land use restrictions. Potential future exposures would likely be limited to road utility workers, trespassers, site maintenance workers and contractors involved in the ground water monitoring program.

3.0 DOCUMENT BASIS

The following is a summary of the information gathered since the 1998 ROD Amendment that prompted and supported fundamentally changing the remedy selected in the 1991 ROD and 1998 ROD Amendment.

3.1 Technical Impracticability Determination For Ground Water Restoration

Field implementation of the soil and ground water remedies described in the 1991 ROD and the 1998 ROD Amendment has been taking place in the West Road Area, Main

Waste Area, Office Trailer Area, and Easement Area since June 1997 (see Figure 2). The remediation systems initially began as field pilot studies to support remedial design activities and expanded into full-scale remediation systems. The primary technologies used at the site were in-situ bioremediation and soil vapor extraction (SVE). The pumping systems either began operation as dual-phase (i.e., water and vapor) extraction systems or were converted to dual-phase early in the process. All extraction wells were closely spaced in areas of high contaminant mass in order to achieve maximum capture. For operational reasons, the Office Trailer Area was divided into three sections: the Central B-53/MW-45 Area, the main Office Trailer Area, and the MW-10 Area. The Easement Area was divided into north and south areas. Other technologies applied in more recalcitrant areas included in-situ thermal desorption (i.e., soil heating), in-situ chemical oxidation (potassium permanganate injection) and bioaugmentation.

In general, the extent of the ground water plumes has been greatly reduced and a significant amount of contamination has been removed. To illustrate this point, Figures 3 and 5 show the maximum historical plume concentration and extent for benzene in the site's Main Waste Area and North Easement Area. The historical plume maximum values are generally pre-1996 values but some of the data presented was collected later as additional delineation wells were added for plume definition. For comparison, Figures 4 and 6 show the first quarter 2004 measured plume concentrations for benzene in the Main Waste Area and North Easement Area. Benzene is present in all the remediation areas and had the highest mass in these areas. Figures 7 through 13 show the cumulative ground water mass removal rates for benzene in remediation areas across the site. These figures clearly show that the benzene mass removal rates had plateaued.

Soil contamination at the site has been addressed through excavation, soil vapor extraction and in-situ thermal desorption. With the exception of excavation, these technologies are integral with the groundwater remediation system (i.e., soil vapor extraction pulls mass from the vadose zone as well as from the ground water zone, particularly in areas where soil heating has been performed). This makes it difficult to demonstrate the effectiveness of soil remediation technologies alone. However, evaluating residual mass in the soil is important as it relates the inability to achieve the ground water criteria.

An analysis of the effectiveness of the soil vapor extraction systems has been made. This analysis is based on flow and benzene concentration measurements at the influent for each of the two thermal oxidizers used at the site. Figure 14 shows the cumulative mass of benzene removed from the thermal oxidizer location in the Main Waste Area. This thermal oxidizer treated SVE system gas from the West Road, Main Waste, Office Trailer and MW-10 areas. This figure shows that over 6000 pounds of benzene have been removed and that the benzene mass removal rate had leveled off after about 4 ½ years of operation. The past 2½ years of operation showed little to no value in operating the system. The other thermal oxidizer was located in the North Easement Area and served both the North and South Easement. The cumulative benzene mass removed from this area is shown in Figure 15. Figure 15 shows that over 20,000 pounds of benzene have been removed from this area. A rapid level in all of the mass removal is

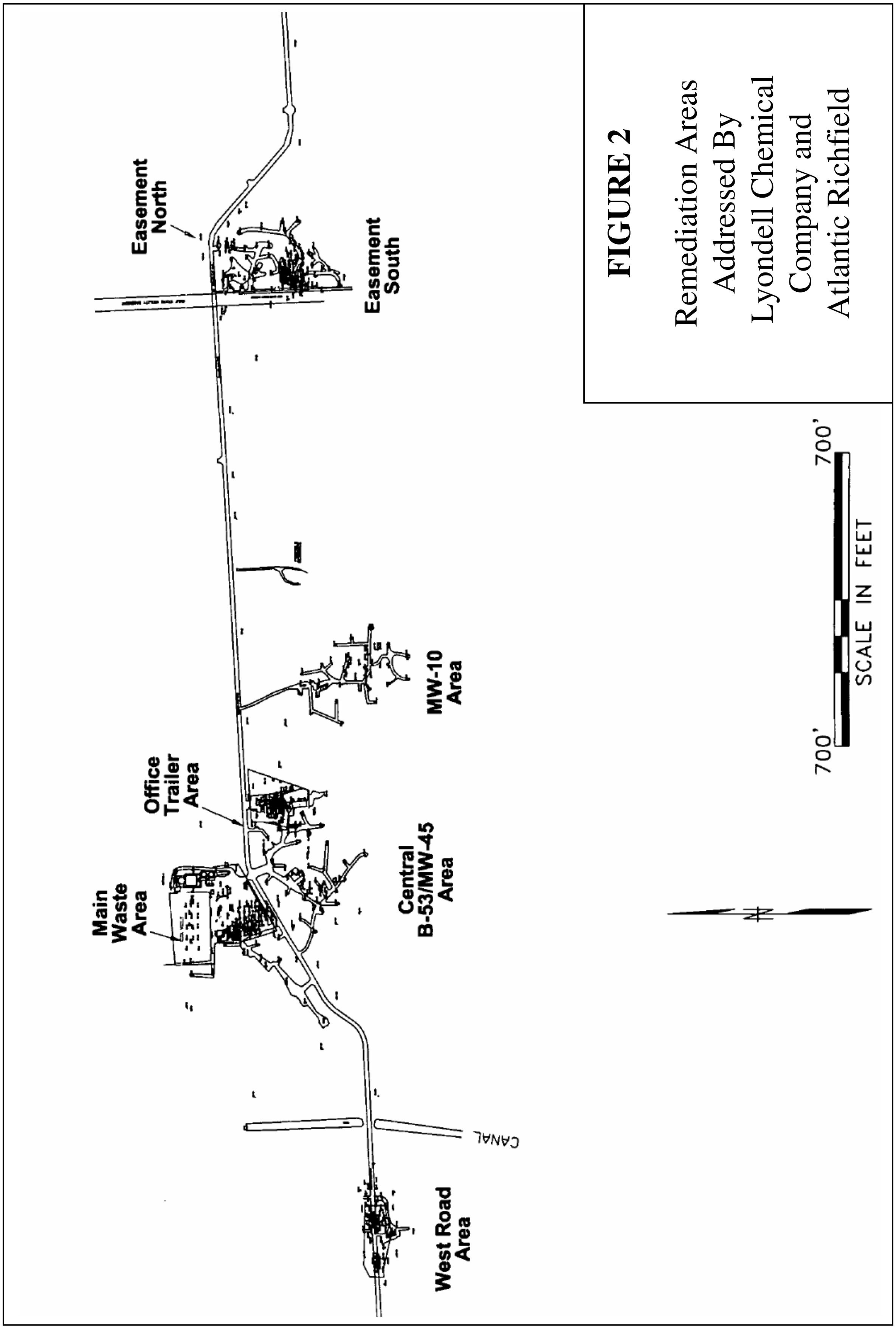


FIGURE 2

Remediation Areas Addressed By Lyondell Chemical Company and Atlantic Richfield

FIGURE 3
Main Waste Area
Maximum Historical Benzene
Plume Concentrations

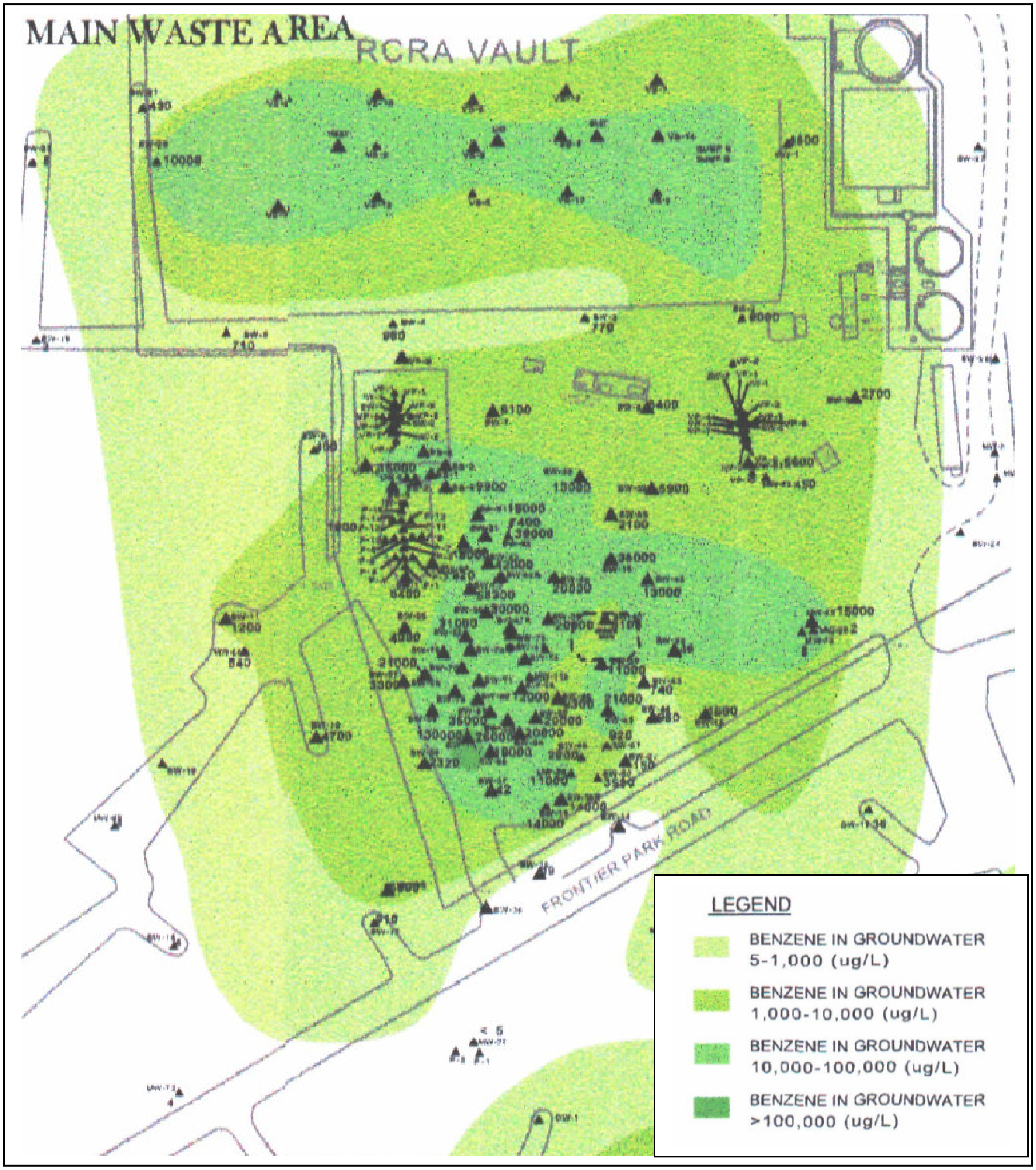


FIGURE 4
Main Waste Area

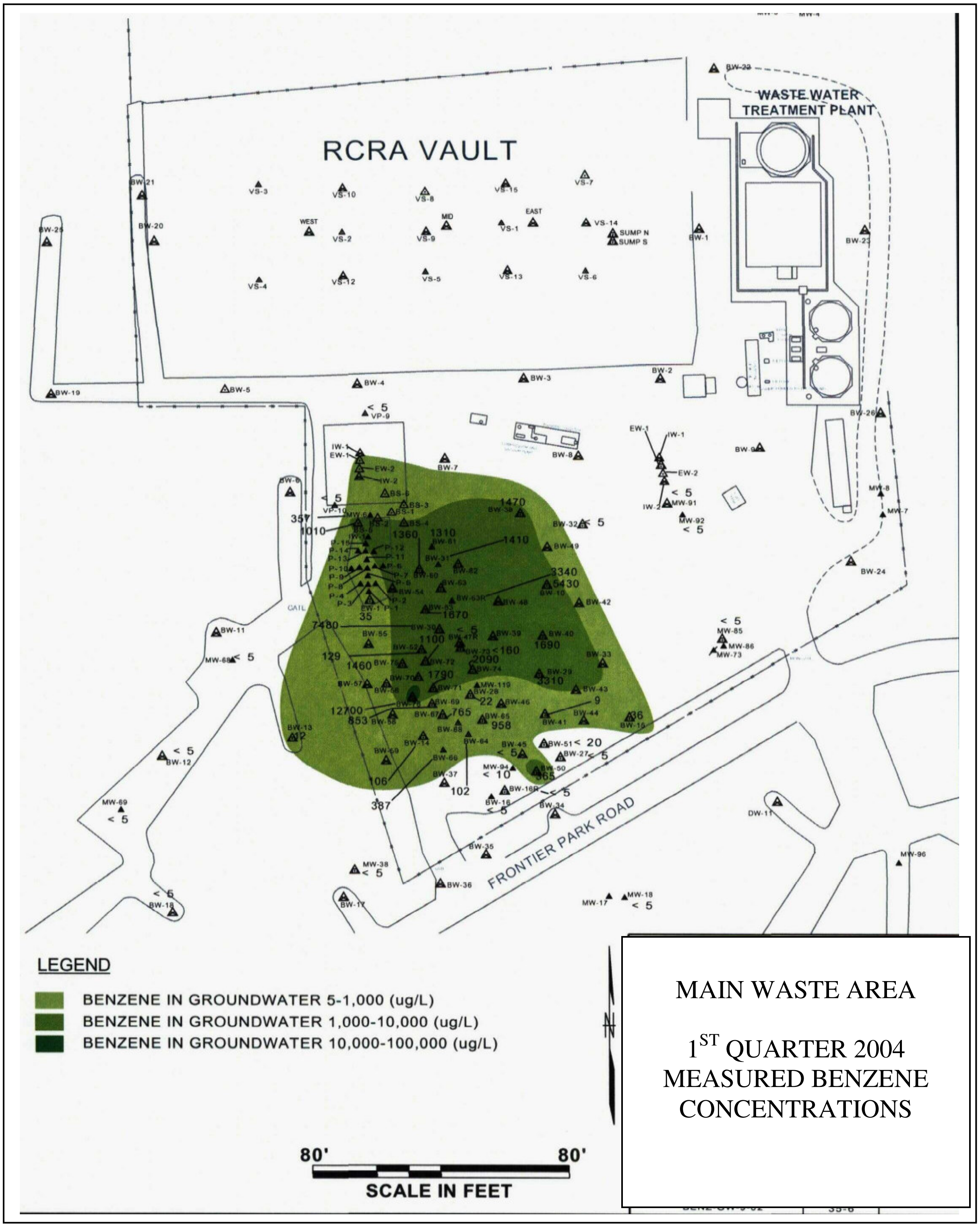


FIGURE 5

North Easement Area

Maximum Historical Benzene Plume Concentrations

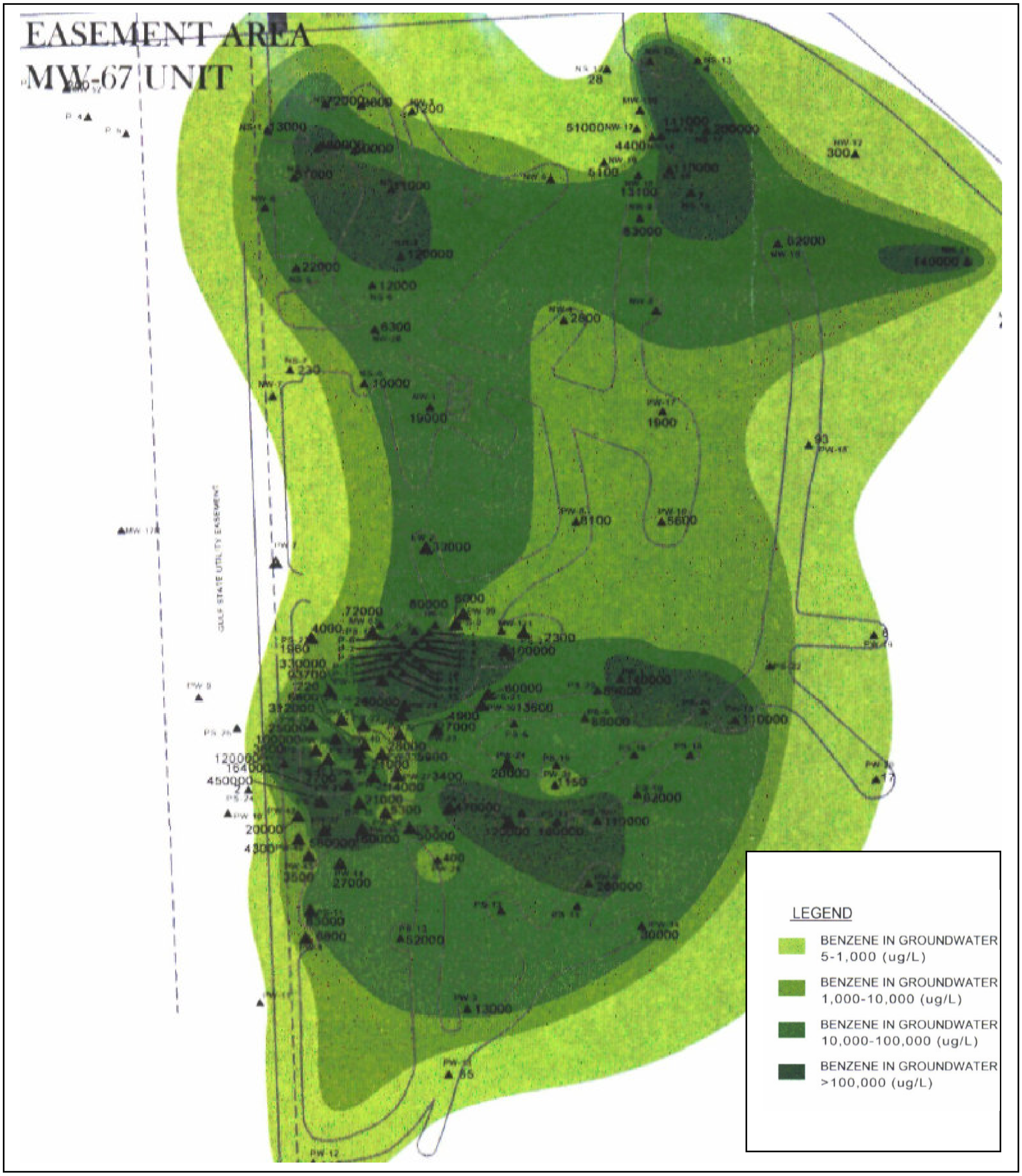


FIGURE 6
NORTH EASEMENT AREA

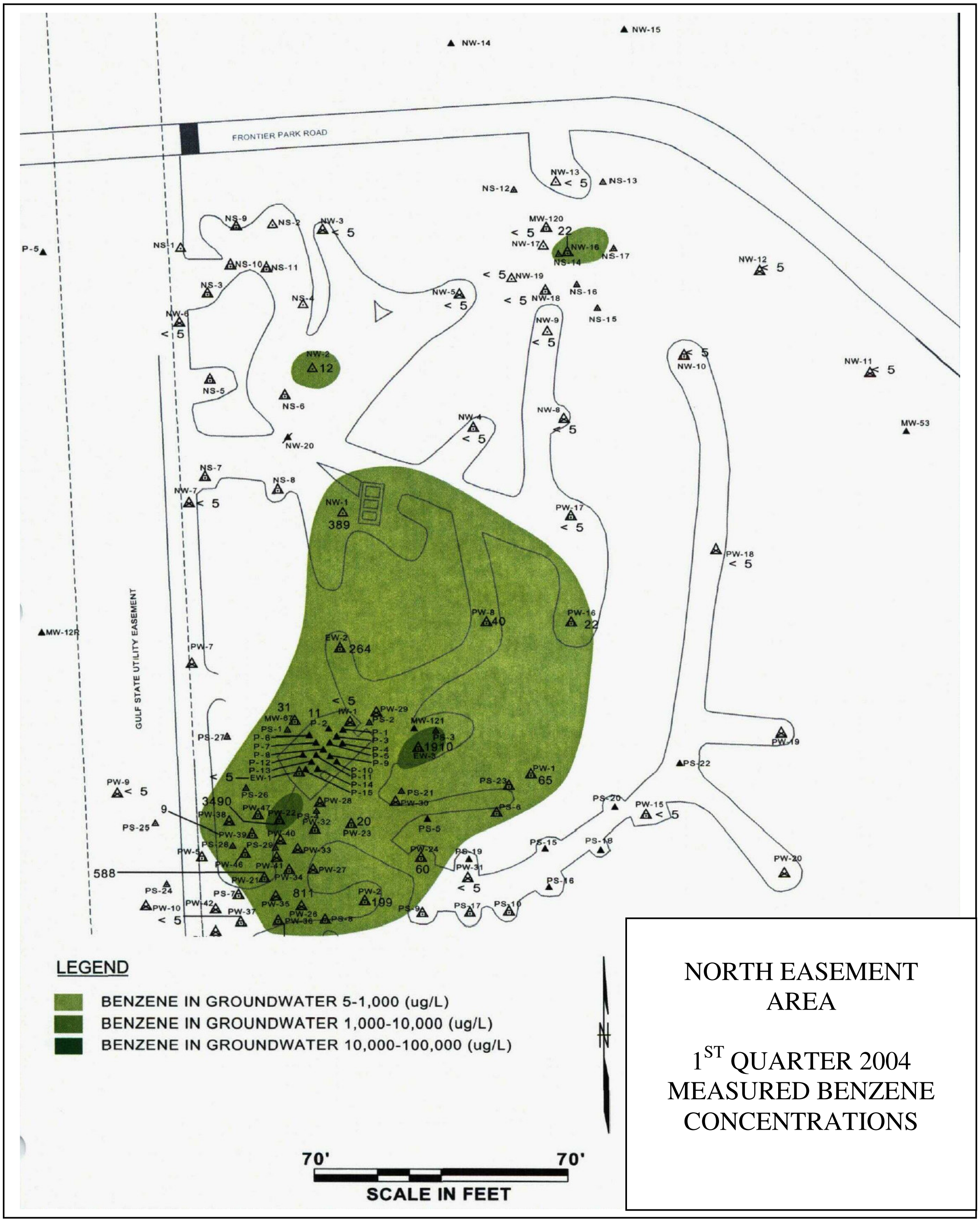


FIGURE 7
West Road Area
Benzene Mass Removed From Ground Water

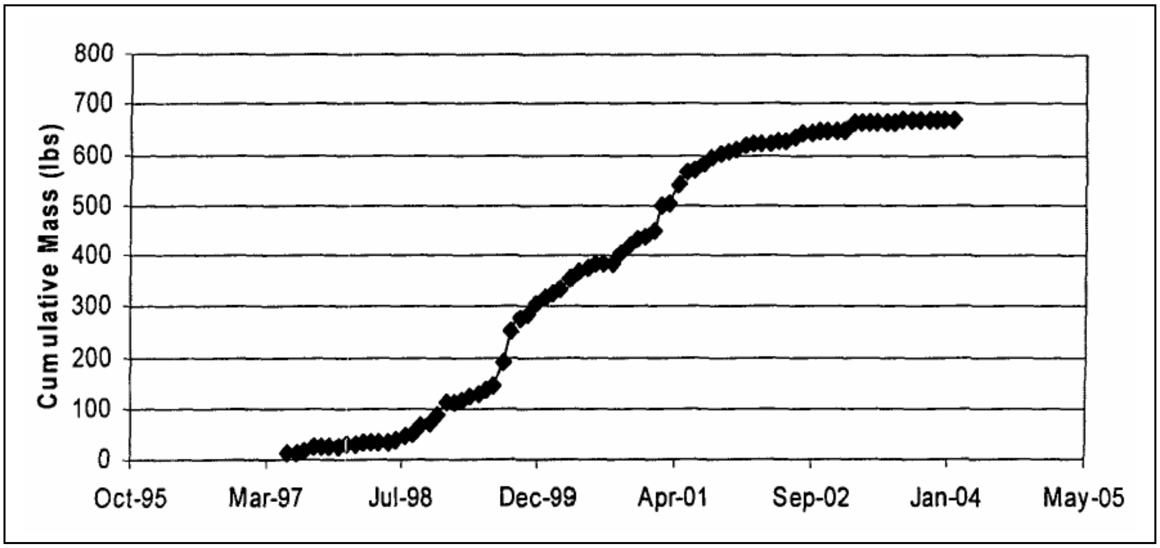


FIGURE 8
Main Waste Area
Benzene mass Removed from Ground Water

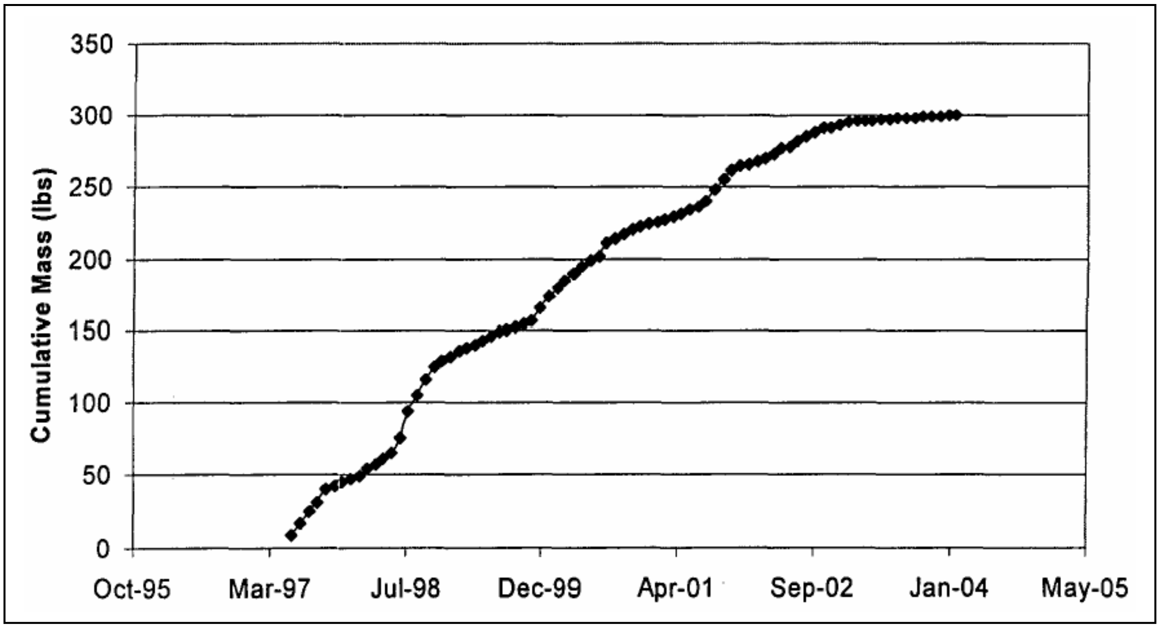


FIGURE 9
B53/MW-45 Area
Benzene Mass Removed from Ground Water

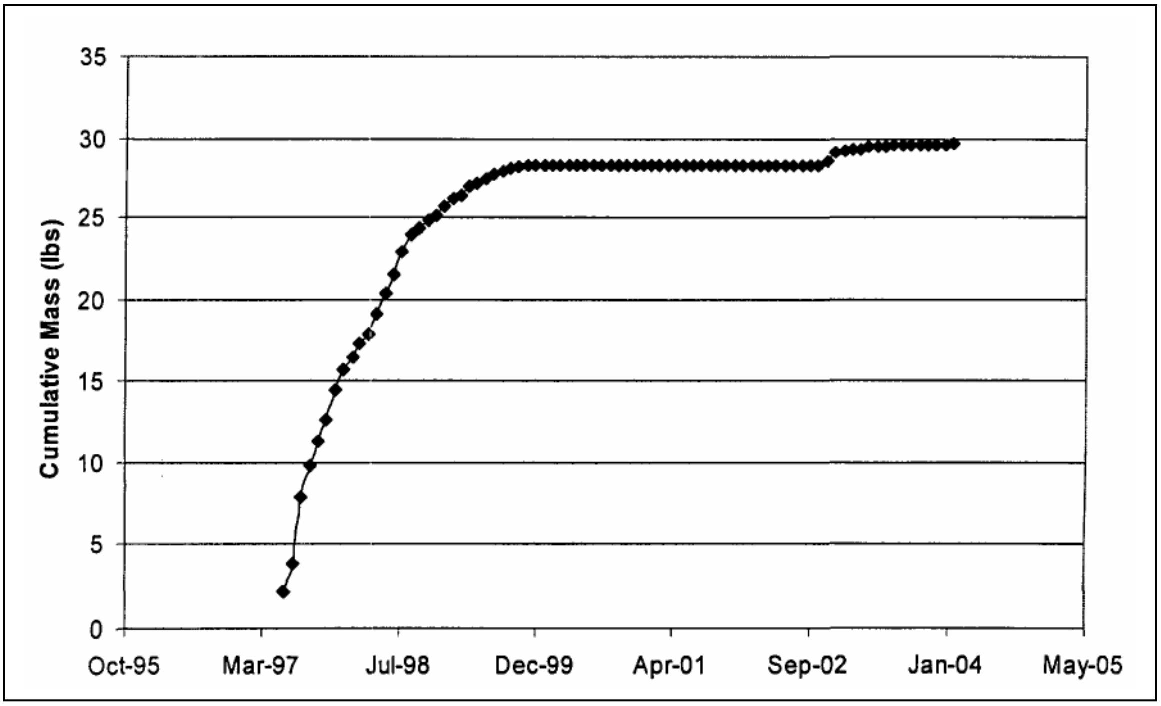


FIGURE 10
Office Trailer Area
Benzene Mass Removed from Ground Water

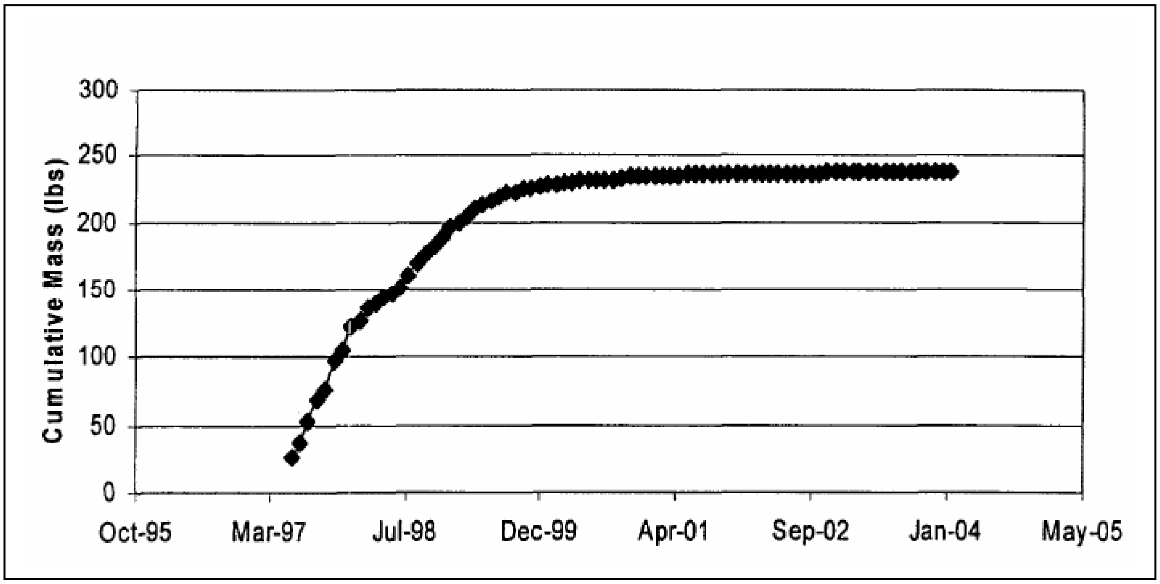


FIGURE 11
MW-10 Area
Benzene Mass Removed from Ground Water

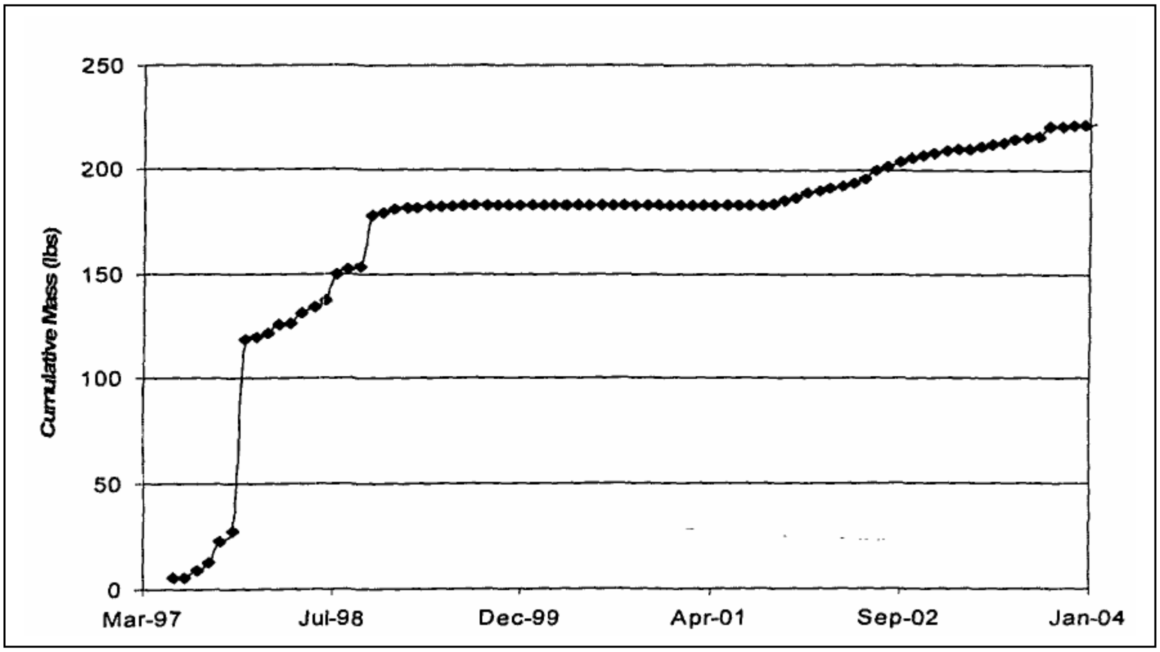


FIGURE 12
North Easement Area
Benzene Mass Removed from Ground Water

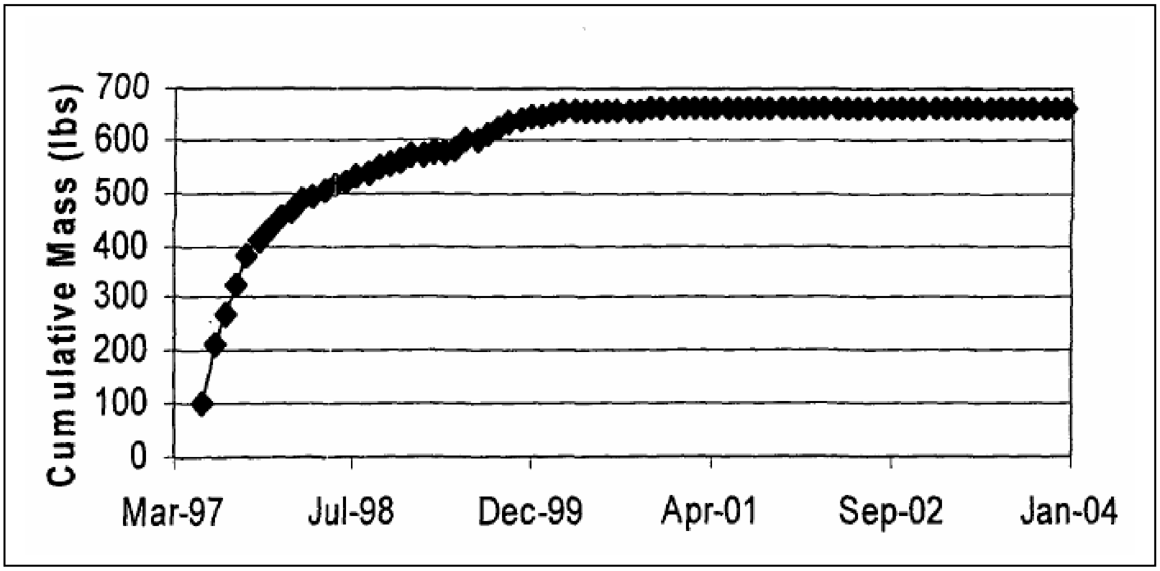


FIGURE 13
South Easement Area
Benzene Mass Removed from Ground Water

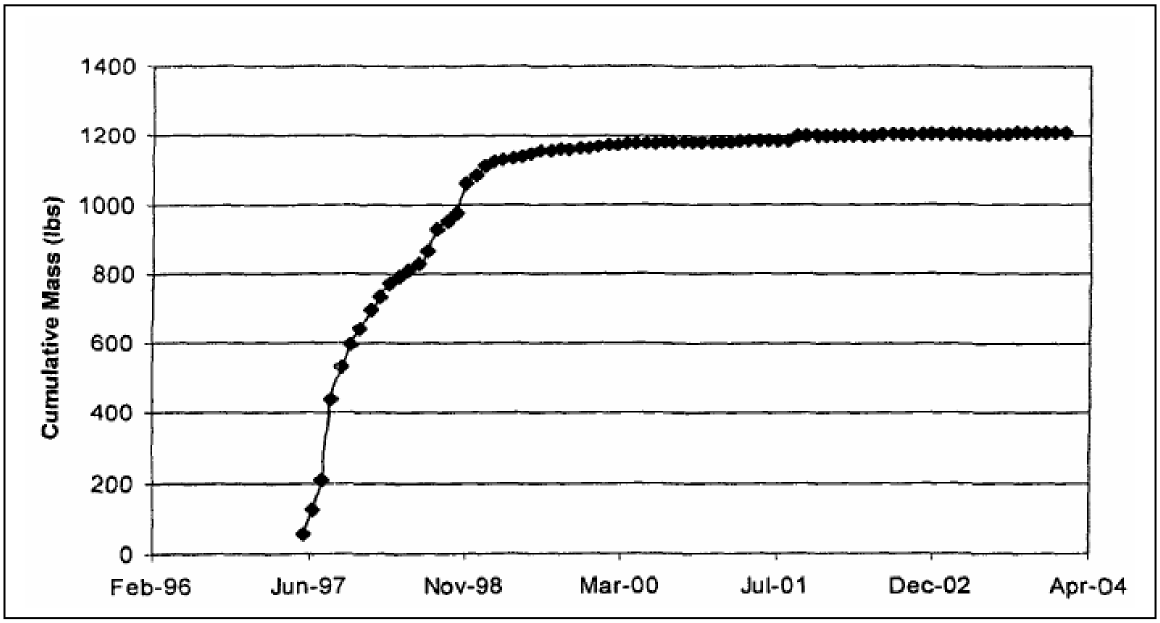


FIGURE 14
Main Waste Thermal Oxidizer
Benzene Mass Removed

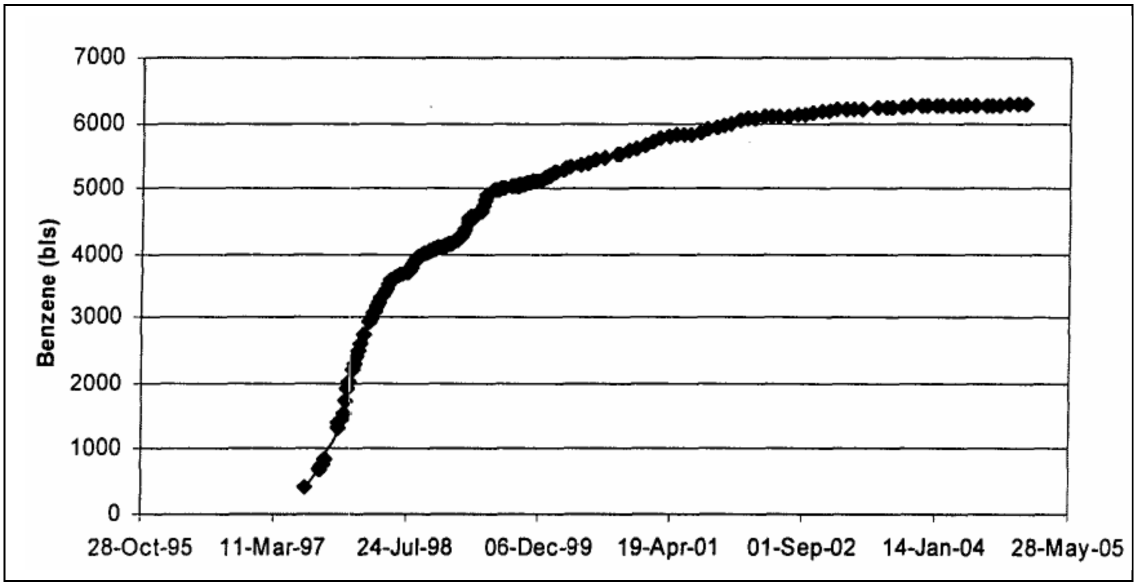
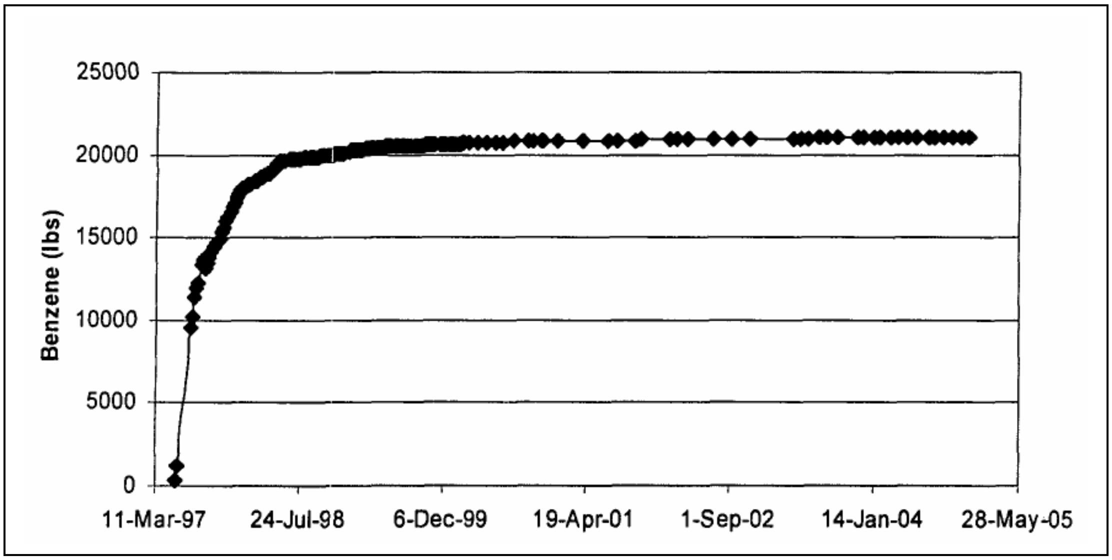


FIGURE 15
North Easement Thermal Oxidizer
Benzene Mass Removed



observed following one year of operation. Although the SVE system and North Easement Area was terminated in it 2001, the leveling off of the mass removal occurred well before this. The figure also does not show any significant removal increase due to the operation of the in-situ thermal desorption (ISTD) systems, which operated from October 1998 to December 2001 in both areas.

3.1.1 Soil Boring Evaluation

Soil borings were drilled in soil hot spots in December 2004 in order to evaluate the effectiveness of the ISTD systems and to obtain data on the vertical distribution of contaminants in the soil. The following borings were drilled:

TABLE 1 - SOIL BORING LOCATIONS

Boring/Sample ID	Area	Comments
B-500D	West Road	Drilled in west ISTD area
B-458D	West Road	Drilled in east ISTD area
B-119D	B-53/MW-45	Drilled in ground water hot spot
B-579D	Main Waste	Drilled in ISTD area
B-206D	Office Trailer	Drilled in ISTD area
B-712D	MW-10	Drilled in ground water hot spot
B-441D	Easement North	Drilled in ISTD area
B-711D	Easement South	Drilled in ground water hot spot
B-453D	Easement South	Drilled in ISTD area

Soil samples were collected every two feet to a total depth of 24 feet. Observations of the soil were also made to note any presence of non-aqueous phase liquid (NAPL) or residual effects from soil heating (i.e., desiccation fractures or dried soil). No NAPL or residual soil heating effects were noted in the soil samples. The concentration profile changes over time showed varied results. Some borings showed an increase in benzene and naphthalene concentration after soil heating. Other borings showed good concentration decreases while others showed what appears to be a re-distribution of naphthalene from a higher to lower elevation.

As a demonstration of residual mass, the two intervals for each of the above borings demonstrating the highest contaminant concentrations were subjected to the Synthetic Precipitation Leaching Procedure (SPLP). The SPLP data showed that after a 7-day leaching tests only about 9% to 13% of the benzene, ethylbenzene and naphthalene mass are recoverable. This data has shown that although benzene mass removal by SVE was successful during the initial operation, actual soil analytical data showed that significant benzene mass remains that is not being recovered by the SVE system. Soil boring data demonstrated that ISTD performance was marginal. Some duplicate borings had mass reduction whereas others showed mass increases or mass redistribution. It is certainly expected that mass was removed during ISTD operations but this is not manifested in either soil boring or SVE data. The leaching data, coupled with soil concentrations from areas subject to both ISTD and SVE, indicate that significant mass remains but at a low mobility thus making further mass removal difficult.

As noted previously, soil excavation work was also done in several areas. The areas and volumes removed are shown in Table 2 below.

TABLE 2
SOIL EXCAVATION SUMMARY

Area	**Volume Excavated (yd^3)**	**Date**
Office Trailer	420	July 1998
Main Waste	160	October 1998
Main Waste	370	May 1999
Easement North	1000	May 2000
Main Waste	30	November 2002

This excavation work was done in hot spot areas. The excavated soil was bio-treated on-site until concentration reached levels acceptable for offsite disposal as non-hazardous industrial waste.

3.1.2 Revised Conceptual Model

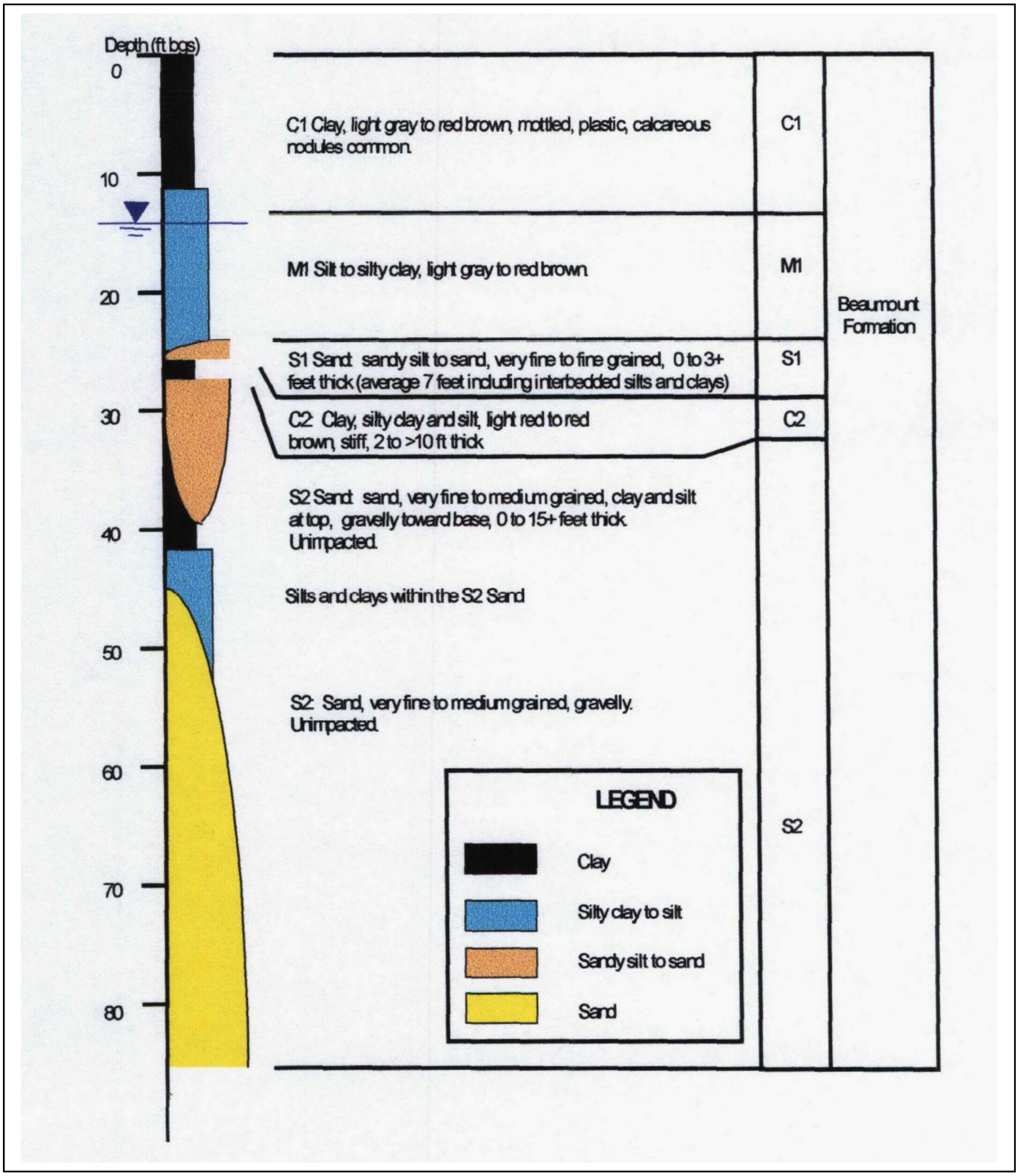
It is important to understand the site's geology and its impact on ground water flow and contaminant migration. The contaminants, left primarily in the site's clay and silt soils, continue to act as a source of contamination to the underlying ground water. The contaminated ground water is contained in the silt and sand units. The shallow lithology is summarized in Figure 16.

The uppermost unit is a clay unit designated as C1. The C1 clay is about 12 feet thick, heavily rooted by grasses and shrubs to about a one foot depth, moderately rooted to about three feet, with less frequent pine roots to about 10 feet. The C1 overlies a silt unit, the M1, and a basal sand unit, the S1. The M1 silt and contiguous S1 sand lie between approximately 12 and 29 feet below grade under the entire site. The C2 clay lies at the base of the S1 sand and varies from two to more than ten feet thick. It isolates the S1 sand from the S2 sand, in which local supply wells have typically been installed. These units are part of the Beaumont Formation, which dips southeasterly towards the Gulf.

Residential wells at the site typically screened in a deeper sand zone about 200 feet below grade. Sands below 200 feet deep can provide high quality water and good yield. For example, the site's water supply well could sustain 80 gallons per minute from a screened interval at 170-200 feet, with a total dissolved solid concentration of less than 200 mg/L.

As discussed previously, a large mass of the contamination has been removed by the previous remedial activities (i.e., soil vapor extraction, in-situ bioremediation, excavation). It is estimated that it would take up to 160 years and cost $80,625,000 to reach the ground water cleanup criteria with continued operation of the site's remedial system in the West Road Area, Main Waste Area, Office Trailer Area, and Easement Area. Other potential remedial technologies were evaluated and determined to not be viable due primarily to their inability to remove the remaining mass of contamination from the site's clay and silt soils in an efficient and cost effective manner. It is anticipated that these remaining contaminants will continue to diffuse from the clay and silt, but at much lower concentration gradients than were present before active remediation. These contaminants will continue to diffuse because they still remain at fairly high sorbed concentrations. It is expected that as equilibrium with ground water concentrations is reached, the rate of diffusion will decline.

FIGURE 16
Stratigraphic Summary



3.1.3 Non-Aqueous Phase Liquids

It is important to note the following in respect to the fairly high sorbed concentrations, especially in regards to the potential for NAPL (non-aqueous phase liquids):

- For the CR 126 West Area, numerous investigations have been by conducted by Lyondell Chemical Company, EPEC Polymers, and by the EPA over the past six years. The soil concentrations present today indicate that there are no recoverable free non-aqueous phase waste liquids, but it is evident based on the shallow ground water concentrations that residual waste constituents remain adsorbed as thin films on the clay and silt that are the predominant soil within the shallow water bearing zone. Following active remediation in this area, two years of transitional monitoring will be conducted to confirm plume conditions and evaluate natural attenuation.

- For the West Road Area, Main Waste Area, Office Trailer Area, and Easement Area, for over 15 years ARCO Chemical Company (which was purchased in 1999 by Lyondell Chemical Company) has been conducting investigations and remediation activities in these areas. They have installed hundreds of wells and taken literally tens of thousands of soil and groundwater samples. From 1997 until 2005, they had several fulltime contractors onsite conducting active remediation using several technologies. During active remediation, they injected over 100 million gallons of water amended with oxygen and nutrients to enhance bioremediation, and removed thousands of pounds of contaminants from both soil and groundwater. For areas requiring focused remediation, hot spot remedial techniques (i.e., in-situ thermal treatment, excavation) were applied. While NAPL may be present in localized areas of the site, NAPL has never been observed in any of the wells. Any concerns about plume migration will be addressed by Lyondell's transition monitoring. This effort involves over 140 wells and is intended to both confirm the plume conditions (i.e., establish baselines) and evaluate the natural attenuation processes. The two year transitional monitoring program has already started in the areas discussed above.

- For the Bayou Disposal Area, NAPL has never been suspected based on the numerous soil investigation activities and several years of ground water monitoring. Further ground water monitoring in the Bayou Disposal Area is not anticipated.

3.1.4 Technical Impracticability Determination

Based on the information gathered over the years, the EPA has determined that restoration of the ground water in portions of the S1 and S2 sands is technically impracticable and that the applicable or relevant and appropriate requirements (ARARs) for groundwater restoration will be waived for designated portions of the S1 and S2 sands (i.e., TI Zones). While the ground water restoration requirements will not apply within these TI Zones, these standards will continue to apply outside the TI Zones.

The TI Zones will be identified for the impacted portions of the S1 and S2 sands in the West Road Area, Main Waste Area, Office Trailer Area (including the Central B-53 Area and MW-45 Area), Easement Area (North and South), as well as in the CR 126 West Area, which is discussed in detail below. Prior to defining the TI Zones at the site, a two-year transitional monitoring period of the S1 and S2 sands will occur. The purpose of this monitoring will be to further characterize the hydrogeologic conditions and the lateral and vertical extent of contaminants that exceed the ground water protection standards. This information will be used to determine the TI boundaries and to determine if the selected remedy is effective in preventing contaminants with concentrations exceeding the ground water protection standards from migrating beyond the TI zone boundaries. Information will also be specifically developed to determine whether the response action described in this amended ROD will be effective over the long term in preventing the migration of contaminants with concentrations greater than the groundwater protection standards to the S2 sand for those areas of the site where the S2 sand does not presently contain contaminants above these concentrations If ground water monitoring indicates that the extent of the ground water is expanding in either the S1 or S2 sands in any of the impacted areas of the site, either vertically or horizontally, additional studies will be conducted as necessary to develop and evaluate alternative contingent remedial measures that may be required to address the expanding plume migration, and appropriate remedial measures will be implemented.

3.2 CR 126 West Area (a.k.a. Far West Road Area) Designation

The CR 126 West Area is located along CR 126 just east of FM 563 (see Figure 17). There are three families living adjacent to the CR 126 West Area, one to the north and two to the south for CR 126. One additional family lives immediately to the west of the area, across FM 563. As with the rest of the site, the exact nature of the disposal activities that took place in this area is uncertain. However, it is evident that wastes were disposed onto CR 126 and on both sides of the road.

The CR 126 West Area was identified as a waste disposal area after issuance of the April 1998 ROD Amendment. In 1999 and 2000, additional wells were installed in this area by Lyondell Chemical Company to delineate the extent of contaminated ground water. As of 2004, a total of 20 shallow wells (approximately 20 feet deep), two intermediate wells (approximately 50 feet deep), and two deep wells (approximately 90 feet deep) had been installed. One shallow slant well was also installed under CR 126 in 2001. Additionally, over 150 soil samples were collected from 21 soil borings to investigate the extent of contaminated soil.

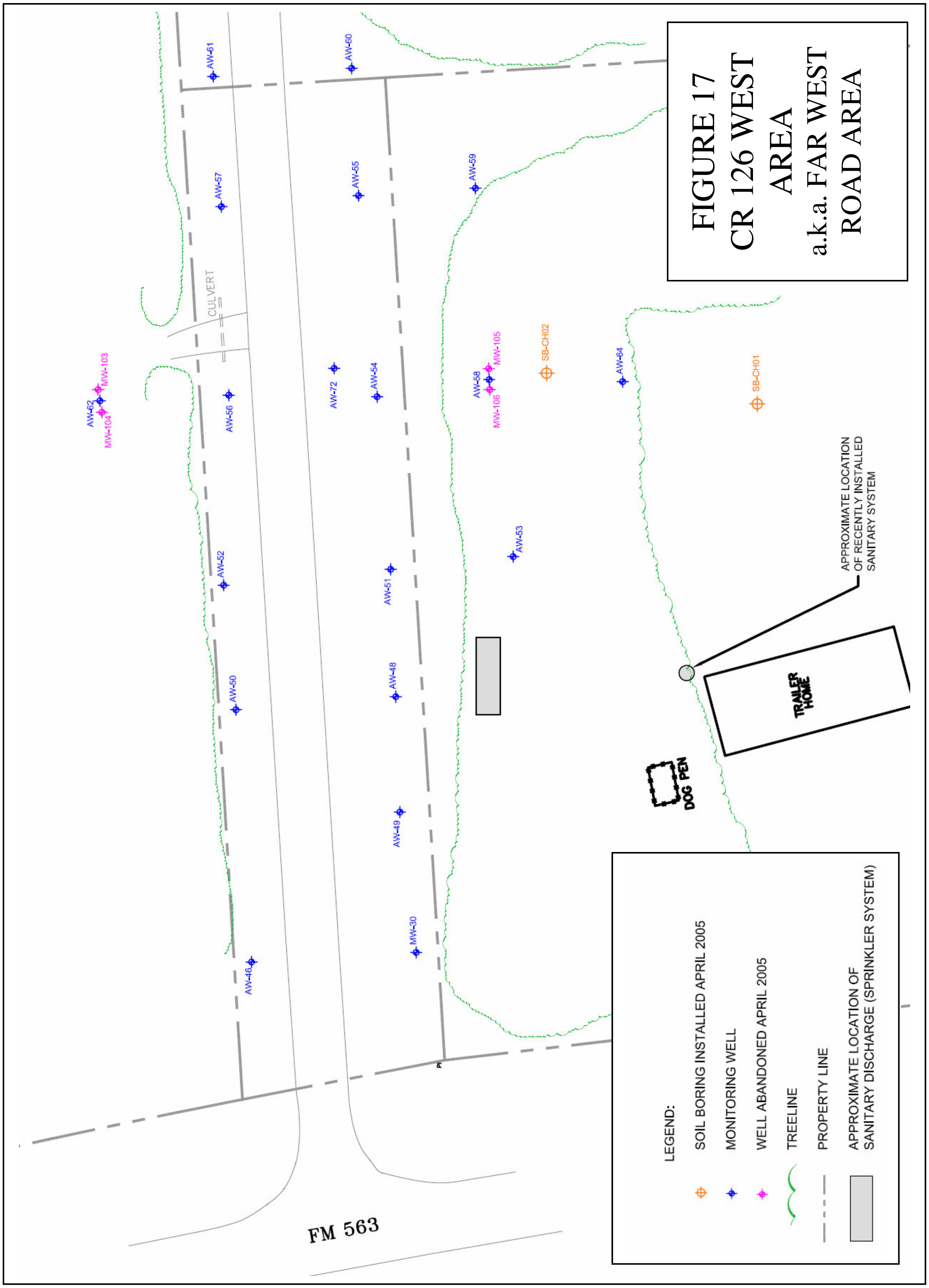


FIGURE 17
CR 126 WEST AREA
a.k.a. FAR WEST ROAD AREA
AW-61
AW-60
AW-57
AW-55
AW-59
CULVERT
MW-103
AW-62
MW-104
AW-56
AW-72
AW-54
AW-58
MW-105
MW-106
SB-CH02
AW-64
SB-CH01
APPROXIMATE LOCATION OF RECENTLY INSTALLED SANITARY SYSTEM
AW-53
AW-52
AW-51
AW-50
AW-48
TRAILER HOME
DOG PEN
AW-49
MW-30
AW-46
FM 563
LEGEND:
SOIL BORING INSTALLED APRIL 2005
MONITORING WELL
WELL ABANDONED APRIL 2005
TREELINE
PROPERTY LINE
APPROXIMATE LOCATION OF SANITARY DISCHARGE (SPRINKLER SYSTEM)

In late February through early March 2004, soil gas sampling was conducted to determine the actual soil gas concentrations in soil near a current residence. Soil gas sampling locations were based on the location of the residence's trailer home in relation to the inferred area of the benzene and vinyl chloride plumes within the S1 ground water zone in the CR 126 West Area. As part of the trailer home set-up, a new septic tank and underground sprinkler lines were installed which have the potential to act as preferential soil gas pathways. The soil gas samples were collected using a grid system with 30-foot spacing. At each location, soil gas samples were collected at two and four feet below ground surface. Sixteen sample locations were placed between the center of the ground water plume and the trailer home (see Figure 18). Four additional sample locations were placed over the center of the ground water plumes.

The soil gas samples were analyzed for specific chlorinated solvents (1,1-DCA, 1,2-DCA, cis- and trans-1,2-dichloroethene, and vinyl chloride), acetone, benzene, toluene, methane, carbon dioxide, ethylene, and light hydrocarbons. The results of the soil gas survey are summarized in Table 3; only samples with at least one detection are shown in Table 3. To summarize, only 1,1-DCA and vinyl chloride were found to exist in any appreciable concentrations. The highest concentrations of vinyl chloride were detected at locations G5 and G6 (0.6 to 0.7 parts per million by volume [ppmv]), which are directly over the ground water plume. The highest concentrations of 1,1-DCA were detected at locations F6 (8.132 ppmv) and G6 (2.873 ppmv), also over the center of the groundwater plumes.

Measurable concentrations of acetone were found at the four-foot depth interval. The highest concentration of acetone was detected at location G6 (13.008 ppmv). No measurable concentrations of benzene were detected in any of the soil gas samples. Although low concentrations of toluene were found in several samples, the contractor (Exploration Technologies, Inc.) stated that toluene of indeterminate origin is often present in soil gas.

In March 2004, samples were collected along the CR 126 right-of-way to determine if volatile organic contaminants were present in the shallow soil at concentrations that could present a risk to a future worker in the area. Soil samples were collected from 62 shallow soil borings along both sides of the CR 126 West Area right-of-way beginning at the intersection of CR 126 and FM 563 in an eastward direction for 450 feet (see Figure 19). The soil borings maintained an interval spacing of approximately 15 feet. The borings were installed using a tractor-mounted Geoprobe™ direct push rig. A soil core from zero to three feet below ground surface was collected at each location using a 1.75-inch core barrel sampler lined with an acetate sleeve. The entire three-foot interval was screened using a flame ionization detector (FID) and the discrete interval with the highest FID reading was sampled. Soil samples were collected using EnCore® sampling device and were submitted for laboratory analysis.

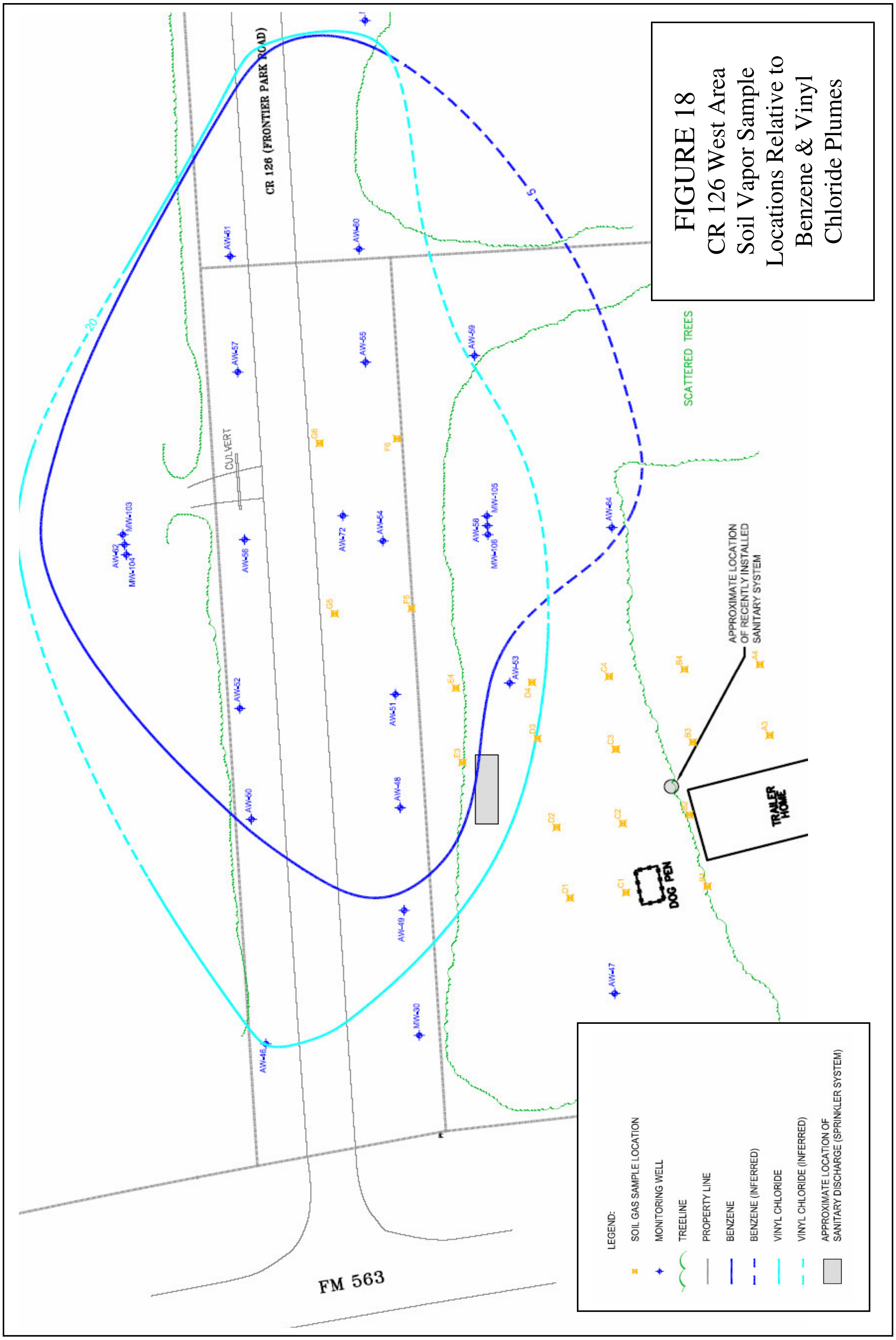


FIGURE 18
CR 126 West Area Soil Vapor Sample Locations Relative to Benzene & Vinyl Chloride Plumes

TABLE 3
Analytical Results Summary- Soil Gas Survey

Sample Location	Depth Interval (feet bgs)	1,1-DCA (ppmv)	1,2-DCA (ppmv)	cis-1,2-DCE (ppmv)	trans-1,2-DCE (ppmv)	Vinyl Chloride (ppmv)	Acetone (ppmv)	Toluene (ppmv)	Xylene (ppmv)
A3	4.0	--	--	--	--	--	--	0.119	--
A4	2.0	--	--	--	--	--	--	0.060	--
B1	2.0	--	--	--	--	--	--	0.055	--
	4.0	--	--	0.033	--	--	--	0.109	--
B2	2.0	--	--	--	--	--	--	0.050	--
	4.0	--	--	0.043	--	--	--	0.113	0.054
B3	4.0	--	--	--	--	--	--	0.138	--
B4	2.0	--	--	--	--	--	--	0.154	--
C3	2.0	--	--	--	--	--	--	0.050	--
	4.0	--	--	--	--	--	--	0.056	--
C4	4.0	--	--	--	--	--	--	0.054	--
D1	2.0	0.036	--	--	--	--	--	0.056	--
	4.0	--	--	--	--	--	--	0.103	--
D3	4.0	--	--	--	--	--	--	0.151	--
D4	2.0	--	--	--	--	--	--	0.115	--
	4.0	--	--	--	--	--	--	0.168	--
E4	2.0	--	--	--	--	--	--	0.121	--
	4.0	--	--	--	--	--	--	-- (0.068)	--
F5	2.0	0.051	--	--	--	--	--	--	--
	4.0	0.710	--	--	--	--	0.296	--	--
F6	2.0	0.454	--	--	--	--	--	--	--
	4.0	8.132	--	--	--	--	2.691	0.127	0.054
G5	2.0	0.047	--	--	--	--	--	0.114	--
	4.0	0.151	--	0.031	--	0.605	5.825	0.130	0.063
G6	2.0	0.047	--	--	--	--	--	--	--
	4.0	2.872 (0.956)	--	0.030 (--)	0.054 (--)	0.704 (--)	13.008 (3.339)	--	--

Notes:

Duplicate analyses are indicated in parentheses ( ).

bgs	Below ground surface
DCA	Dichloroethane
DCE	Dichloroethene
ppmv	Part per million by volume
--	Not detected at the sample quantitation limit

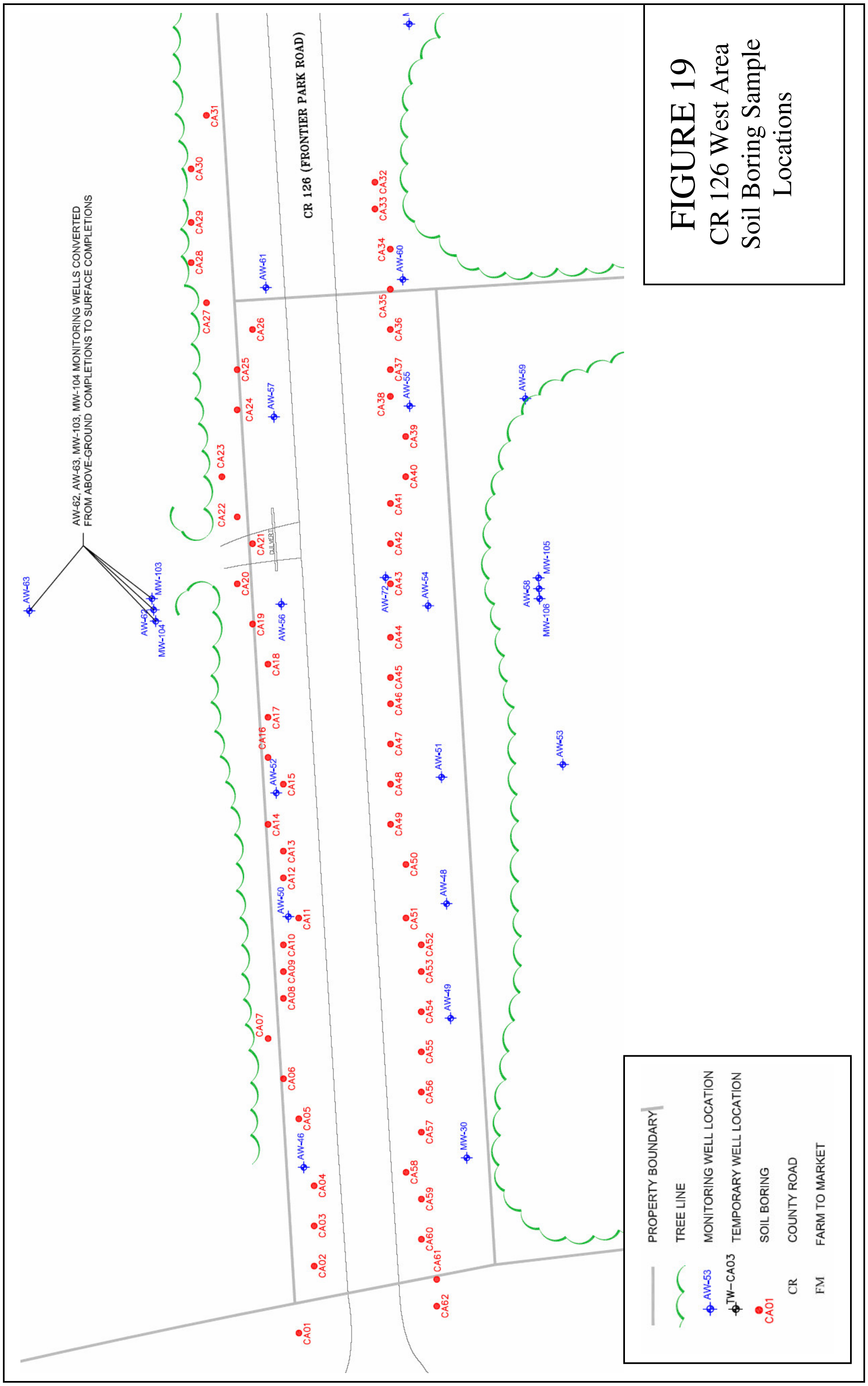


FIGURE 19
CR 126 West Area
Soil Boring Sample
Locations

The analytical results for those soil samples with at least one detected analyte are summarized in Table 4. For comparison purposes, the US EPA Region 6 Medium-specific Screening Levels (MSSLs) for an outdoor worker are shown in Table 4. No volatile organic compounds were detected in the CR-126 right-of-way samples at concentrations exceeding their respective MSSL for an outdoor worker.

In April 2005, samples were collected from two sample locations on the residential property located north of CR 126 (SB-CH01, SBCH02) (see Figure 20). Samples were collected from three intervals: 0 to 2 feet below ground surface (bgs), 8 to 10 feet bgs, and 10 to 12 feet bgs. Discrete samples were selected for VOCs, SVOCs, and metals analysis. Analytical results are summarized in Table 5.

At location SB-CH01, acetone and methylene chloride were detected in each of the soil samples. Detected acetone concentrations range from 0.007 LJ to 0.067 mg/kg, which is well below the US EPA Region 6 MSSL for residential soils (i.e., 70,000 mg/kg). The "L" qualifier means the reported concentration is below the contract required quantitation limit. The "J" qualifier means the reported value is estimated. Methylene chloride concentrations ranged from 0.005 LJ mg/kg to 0.009 LJ mg/kg, which is well below the US EPA Region 6 MSSL for residential soil (i.e., 8.9 mg/kg).

At location SB-CH02, acetone, 1,1-DCA, and methylene chloride were detected. Acetone was detected at a concentration of 0.013 mg/kg in the sample collected at a depth of 0 to 2 feet bgs. 1,1-DCA was detected in each of the soil samples collected; concentrations ranged from 0.006 LJ mg/kg to 1.2 mg/kg. 1,2-DCA was detected in the samples collected at 8 to 10 feet bgs and 10 to 12 feet bgs at concentrations of 0.13 mg/kg and 0.15 mg/kg, respectively. Methylene chloride was detected in the soil sample collected at a depth of 0 to 2 feet bgs at a concentration of 0.004 LJ mg/kg. All detected VOC concentrations at location SB-CH02 were below the US EPA Region 6 MSSL for residential soil.

No SVOCs were detected in any soil samples collected at boring locations SB-CH01 and SB-CH02.

Various inorganic compounds were detected in the soil samples collected at locations SB-CH01 and SB-Ch02. With the exception of arsenic, all detected inorganic concentrations were below the US EPA Region 6 MSSL for residential soil. Arsenic concentrations range from 2.7 mg/kg to 4.5 mg/kg, which exceeds the US EPA Region 6 MSSL for residential soil (i.e., 0.39 mg/kg); however, all detected arsenic concentrations were below the Texas-specific median background arsenic concentration of 5.9 mg/kg.

TABLE 4

Analytical Results Summary – CR 126 Right-of-way Soil Borings

Station Location	Volatile Organic Compounds (mg/kg)										
	Acetone	Benzene	2-Butanone	1,1-DCA	1,2-DCA	trans-1,2-DCE	ETB	PCE	Toluene	Vinyl Chloride	Xylenes
CA19	--	--	--	--	--	--	--	0.006 LJ	--	--	--
CA24	0.082 BJ	--	--	--	--	--	--	--	--	--	--
CA31	0.110 J	--	--	--	--	--	--	--	--	--	--
CA33	0.035 J	--	--	--	--	--	--	--	--	--	--
CA34	0.006 LJ	--	--	--	--	--	--	--	--	--	--
CA36	-- (0.033 J)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
CA37	0.030 J	--	--	--	--	--	--	--	--	--	--
CA38	0.062 J	--	--	--	--	--	--	--	--	--	--
CA39	0.039 J	--	--	--	--	--	--	--	--	--	--
CA40	0.069 J	--	--	--	--	--	--	--	--	--	--
CA41	0.091 J	0.005 LJ	--	0.015	--	--	--	--	--	0.010	--
CA42	0.085 J	--	--	0.170	--	--	--	--	--	0.018	--
CA43	0.089 BJ	0.007 LJ	--	0.380	--	0.007 LJ	--	--	--	0.073	--
CA44	0.110 J	--	--	0.350	0.010	0.004 LJ	--	--	--	0.037	--
CA45	--	--	--	0.100	--	--	--	--	--	0.009 LJ	--
CA46	0.120 J (--)	-- (--)	-- (--)	0.014 (0.004 LJ)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
CA47	--	--	--	--	--	--	--	--	--	0.010 LJ	--
CA49	--	--	--	--	--	--	0.001 LJ	--	0.001 LJ	--	0.005 LJ
CA54	0.030	--	--	--	--	--	--	--	--	--	--
CA55	0.011 J	--	--	--	--	--	--	--	--	--	--
CA56	0.006 LJ (0.011 LJ)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
CA62	0.042 J (0.017 J)	-- (--)	0.016 (0.013)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
Outdoor Worker Soil MSSL	100,000	1.6	34,000	2,300	0.84	240	230	1.7	520	0.43	210

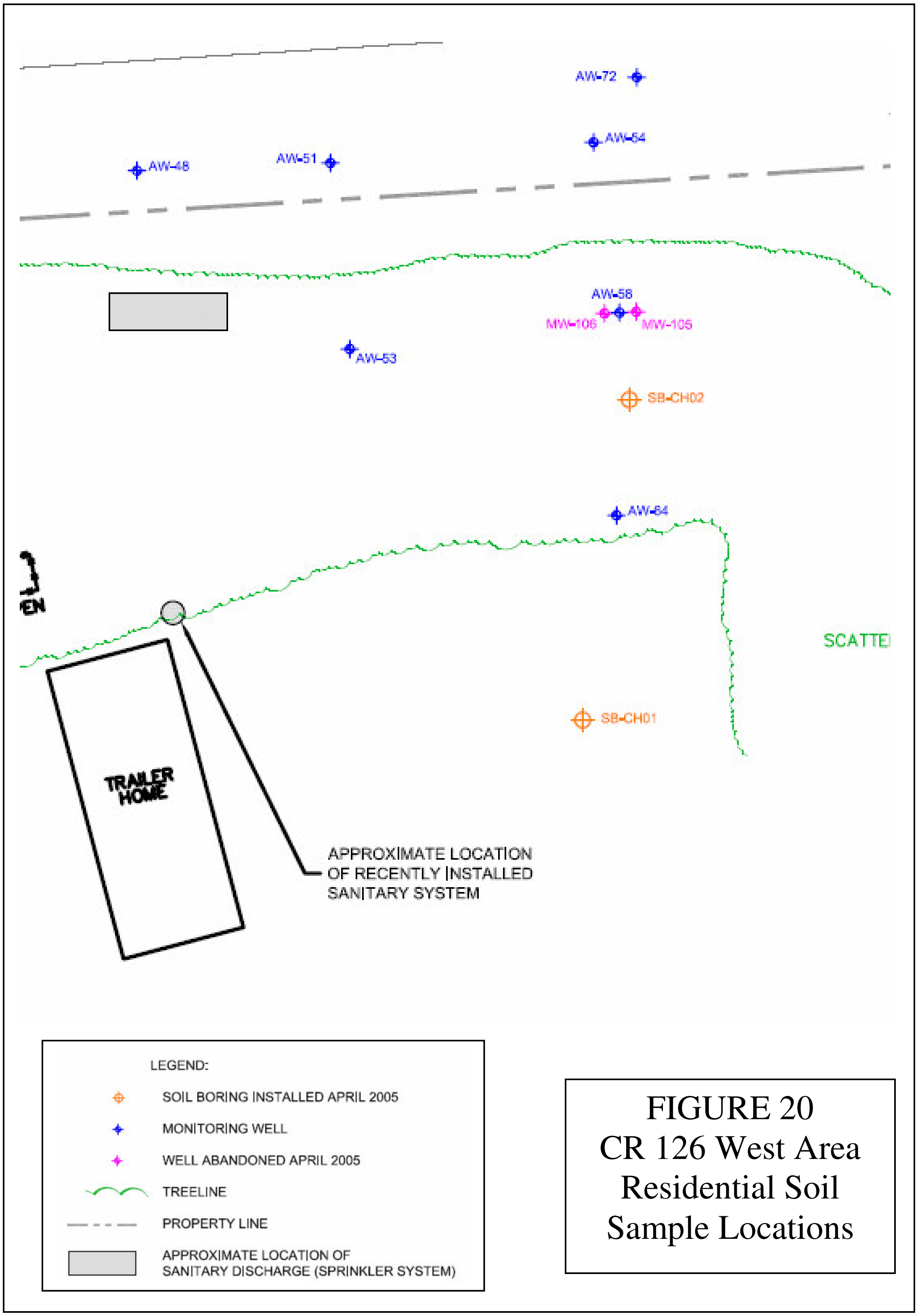


FIGURE 20
CR 126 West Area
Residential Soil
Sample Locations

TABLE 5
ANALYTICAL RESULTS – RESIDENTIAL SOIL SAMPLES

Analyte	SB-CH01 (depth interval, feet bgs) (0-2)	(8-10)	(10-12)	SB-CH02 (depth interval, feet bgs) (0-2)	(8-10)	(10-12)	Residential Soil MSSL
Volatile Organic Compounds (mg/kg)							
Acetone	**0.067 (0.039)**	**0.020**	**0.007 LJ**	**0.013**	<0.04	<0.062	70,000
1,1-Dichloroethane	<0.014 (<0.016)	<0.011	<0.011	**0.006 LJ**	**1.2**	**0.86**	590
1,2-Dichloroethane	<0.014 (<0.016)	<0.011	<0.011	<0.013	**0.13**	**0.15**	0.35
Methylene chloride	**0.009 LJ (0.005 LJ)**	**0.006 LJ**	**0.005 LJ**	**0.004 LJ**	<0.010	<0.012	8.9
Inorganic Compounds (mg/kg)							
Aluminum	**10,900 (10,400)**	**11,300**	**8,890**	**8,300**	**10,800**	**8,090**	76,000
Antimony	<8.1 **(0.56 LJ)**	<7.8	<7.7	<8.2	<7.7	<7.8	31
Arsenic **	**2.7 J (3.1 J)**	**3.6**	**2.8**	**3.2**	**4.5**	**3.4**	0.39
Barium	**155 (163)**	**169**	**149**	**169**	**197**	**135**	5,500
Beryllium	**1.2 (1.3)**	**1.2**	**1.1**	**1.2**	**1.2**	**1.1**	150
Cadmium	<0.68 (<0.69)	**0.090 LJ**	**0.062 LJ**	**0.12 LJ**	**0.19 LJ**	**0.099 LJ**	39
Calcium	**5,000 (5,010)**	**15,400**	**11,800**	**5,730**	**37,400**	**18,400**	NA
Chromium	**13.1 (12.6)**	**13.8**	**11.2**	**9.8**	**13.8**	**9.4**	210
Cobalt	**5.1 LJ (4.7 LJ)**	**5.9 LJ**	**4.0 LJ**	**4.2 LJ**	**8.5**	**4.2 LJ**	900
Copper	**7.1 Jv (7.7 Jv)**	**11.2 Jv**	**9.5 Jv**	**10.3 Jv**	**18.3 Jv**	**11.7 Jv**	2,900
Iron	**14,300 (14,200)**	**15,600**	**12,700**	**9,860**	**16,700**	**10,300**	23,000
Lead	**10.0 J (10.2 J)**	**9.2**	**7.2**	**14.8**	**10.8**	**6.8**	400
Magnesium	**1,120 (1,060)**	**1,680 Jv**	**1,480 Jv**	**953 Jv**	**2,500 Jv**	**2,050 Jv**	NA
Manganese	**150 (201)**	**431**	**129**	**459**	**331**	**101**	3,200
Mercury	<0.14	<0.13	<0.13	**0.034 LJv**	<0.13	<0.13	23
Nickel	**8.7 (8.8)**	**13.0**	**9.2**	**11.4**	**18.4**	**13.6**	1,600
Potassium	<676 (<693)	**738**	<644	<686	**1,370**	**948**	NA
Selenium	<4.7 (<4.8)	<4.5	<4.5	**0.67 LJ**	<4.5	<4.6	390
Silver	**0.40 LJ (0.47 LJ)**	<1.3	<1.3	<1.4	<1.3	<1.3	390
Sodium	**227 LJ (169 LJ)**	**234 LJv**	**303 LJv**	**235 LJv**	**447 LJv**	**544 LJ**	NA
Vanadium	**33.9 J (34.9 J)**	**33.4**	**24.4**	**27.8**	**28.2**	**17.6**	78
Zinc	**17.6 (17.0)**	**23.3**	**19.7**	**23.1**	**40.3**	**30.2**	23,000

Notes:

[a] EPA Region 6 Medium-specific Screening Levels (MSSL) for residential soil (EPA 2003).

No semivolatile organic compounds were detected in the soil samples collected at boring locations SB-CH01 and SB-CH02.

Bold-face type indicates the concentration is greater than the sample quantitation limit.

Shaded cells indicate the detected concentration exceeds the EPA Region 6 MSSL for residential soil.

** Although arsenic concentrations exceed the EPA Region 6 MSSL for residential soil, all detected arsenic concentrations are below the Texas-specific median background concentration of 5.9 mg/kg (Texas Administrative Code 350.1[m]).

Duplicate analyses are indicated in parentheses ( ); for non-detect results, if the sample quantitation limit was the same for both samples, only one value is shown.

EPA U.S. Environmental Protection Agency

J Estimated value

L Reported concentration is below the contract-required quantitation limit.

mg/kg Milligram per kilogram

NA Not available: no EPA Region 6 MSSL for residential soil is available.

Last year investigations were performed by Environmental Resources Management (ERM) on behalf of EPEC Polymers, Inc. to supplement data previously collected in the area. The investigation activities included:

- Membrane Interface Probe (MIP)/Cone Penetrometer Test (CPT) survey (see Figures 21 (S1 Zone) and Figure 22 (S2 Zone) CPT/MIP Sample Locations);
- Installation of additional soil borings and monitoring wells (see Figures 23 and 24 for S1 Zone and S2 Zone Ground Water Sample Location Maps);
- Sampling of permanent and temporary monitor wells to refine the assessment of the shallow soil and ground water conditions in the area;
- Conducting aquifer pump tests; and
- Conducting an in-situ chemical oxidation bench scale test.

The goals of this work were to:

- Further assess the extent of the more affected soils (the source area);
- Assess the current ground water conditions and the lateral and vertical extent of the dissolved phase contaminant plumes in the upper two zones (the S1 and S2 sands);
- Assess waste classification for the more affected soils in order to evaluate excavation as a remedial option;
- Assess matrix and constituent oxidation demands for the shallow two (S1 and S2 sands) aquifers; and
- Assess various water quality parameters.

Organic and inorganic contamination has been identified in the CR 126 West Area. The contamination includes volatile and semi-volatile compounds that were constituents in the waste disposed at or near the CR 126 West Area. Metals are also present in the CR 126 West Area soils but the metals have not migrated significantly from the central source area.

In the CR 126 West Area, the soil analytical results indicate that elevated levels of vinyl chloride; 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), tert-butyl alcohol (TBA), benzene and chloromethane are above the Texas Risk Reduction Program (TRRP) residential soil criteria for ingestion, inhalation, and direct contact (${}^{Total}Soil_{Comb}$) and/or above the ground water protection criteria (${}^{GW}Soil$). The analytical data indicate that about a ½ acre area would exceed TRRP direct contract criteria. This area is located within the CR 126 right of way. Figure 25 illustrates the lateral extent of soil exceeding the TRRP direct contact criteria for benzene and vinyl chloride. The extent of lateral migration and relative levels of soil contaminants were further defined using membrane interface probe (MIP) technology, which does not provide quantitative contaminant concentration data for direct comparison with TRRP ground water protection criteria. Based on the information collected, the estimated area of affected soil is approximately 2.6 acres (See Figure 26).

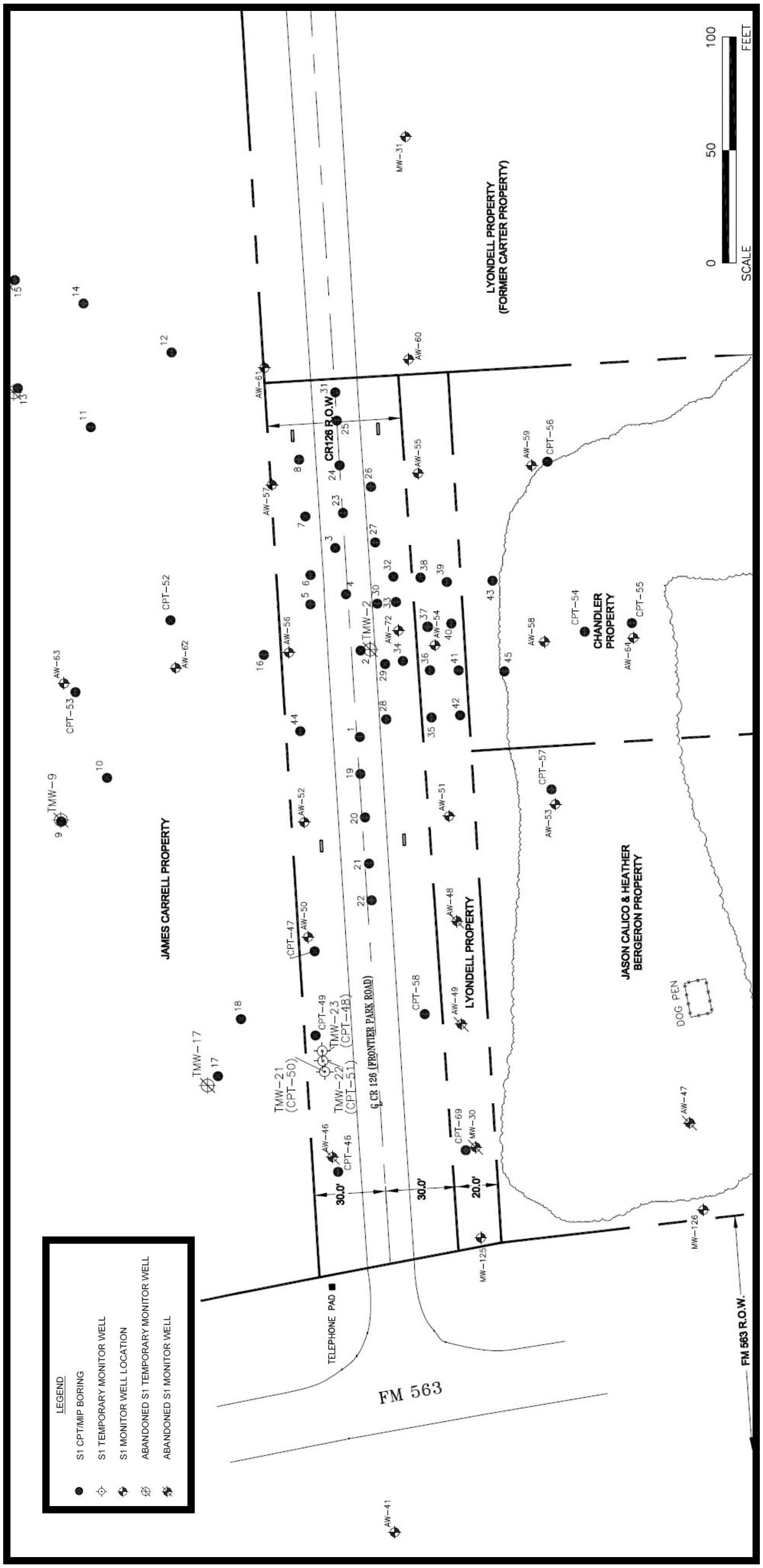


FIGURE 21
S1 Zone CPT/MIP Sample Location Map

FIGURE 22
S2 Zone CPT/MIP
Sample Location Map

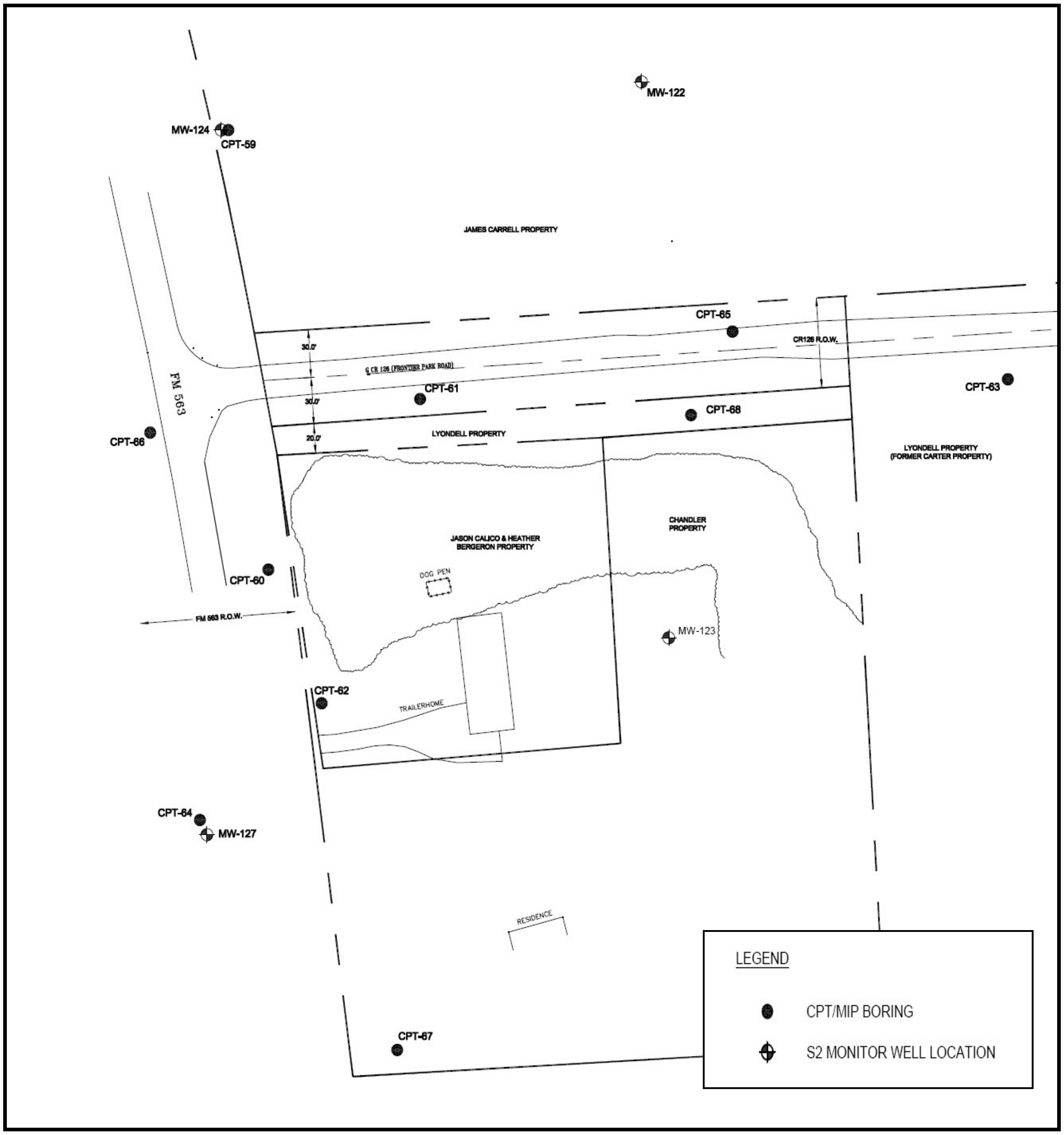


FIGURE 23
S1 Ground Water Sample Location Map

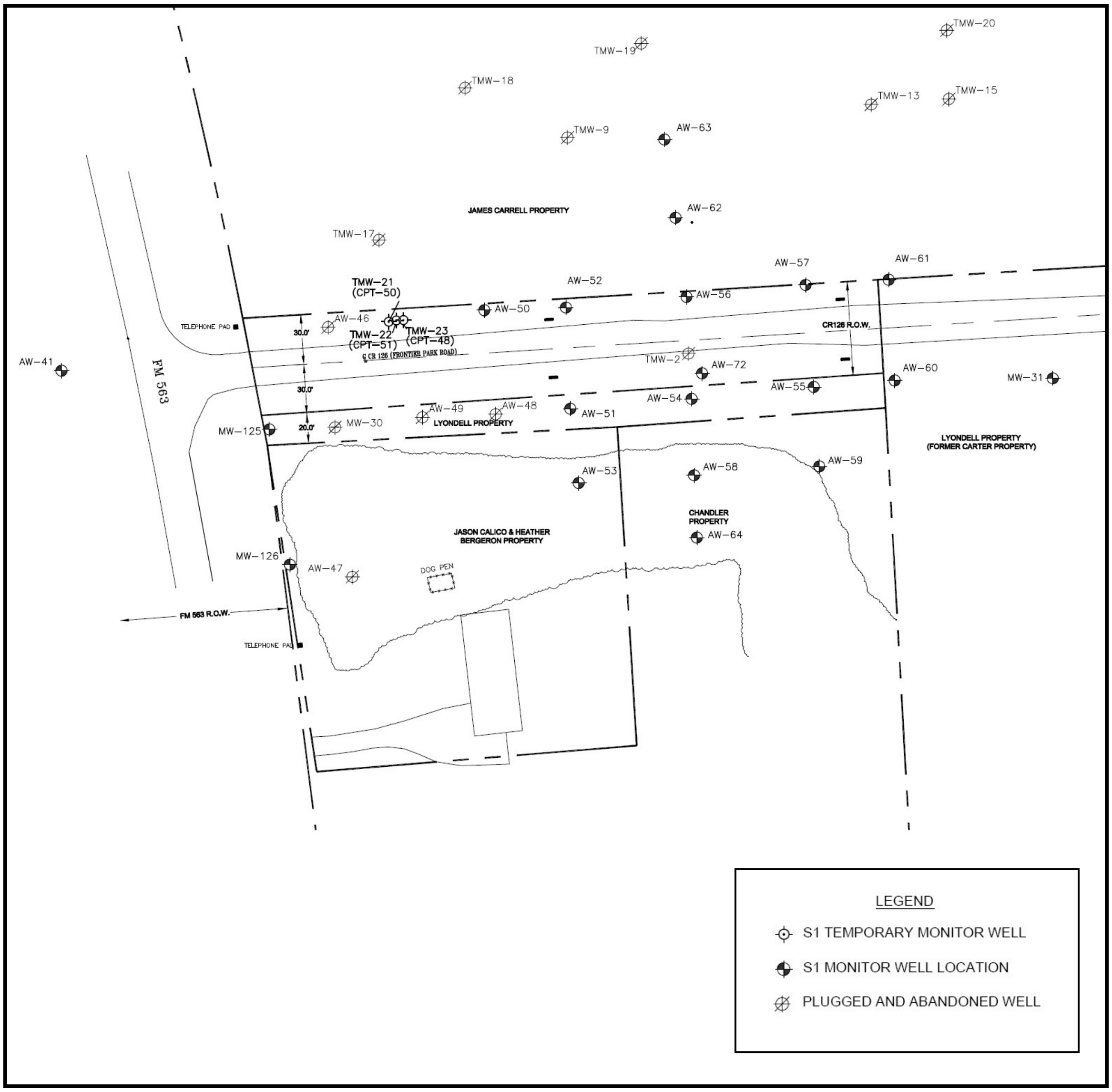
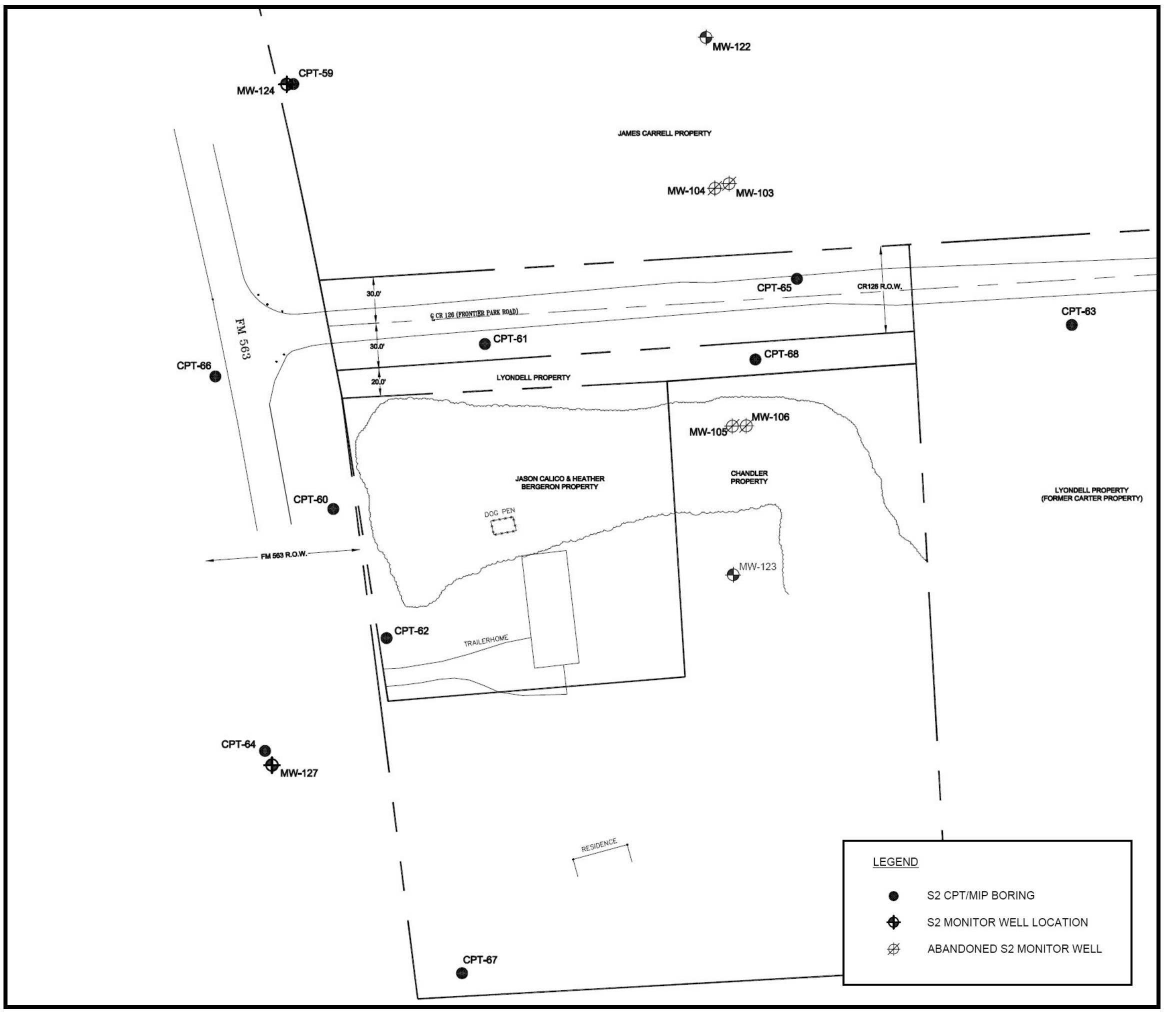


FIGURE 24
S2 Ground Water Sample Location Map



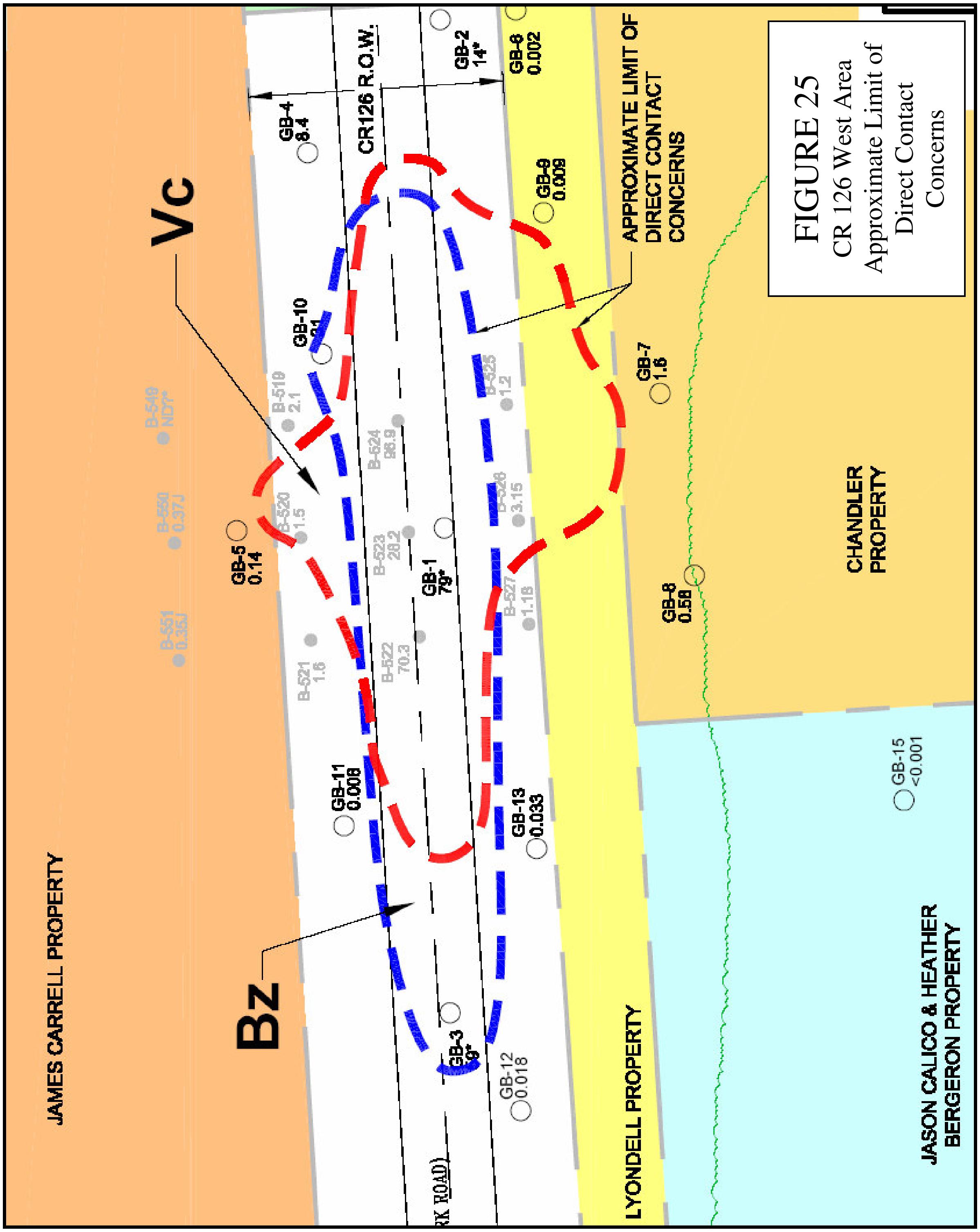


FIGURE 25
CR 126 West Area
Approximate Limit of
Direct Contact
Concerns